Wind Power Inverter

WINDY BOY 3600TL / 5000TL

Installation Guide

WB36TL_50TL-IEN102011 | IMEN-WB36_50TL | Version 1.1

EN

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1 Notes on this Manual

This manual describes the assembly, installation, commissioning and maintenance of the following SMA inverters:

- Windy Boy 3600TL (WB 3600TL-20)
- Windy Boy 5000TL (WB 5000TL-20)

Store this manual where it can be accessed at all times.

1.1 Validity

This manual is valid for the Windy Boy 3600TL and Windy Boy 5000TL.

1.2 Target Group

This manual is for qualified personnel. The tasks described in this manual may be performed by qualified electrical technicians only.

1.3 Additional Information

You will find further information on special topics such as designing a line circuit breaker or the description of the operating parameters in the download area at www.SMA.de/en.

Refer to the user manual for detailed information on operating the inverter.

1.4 Symbols Used

The following types of safety warnings and general information are used in this manual:

DANGER!

"DANGER" indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

"WARNING" indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!

"CAUTION" indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE!

"NOTICE" indicates a situation that can result in property damage if not avoided.

Information

Information provides tips that are valuable for the optimal installation and operation of your product.

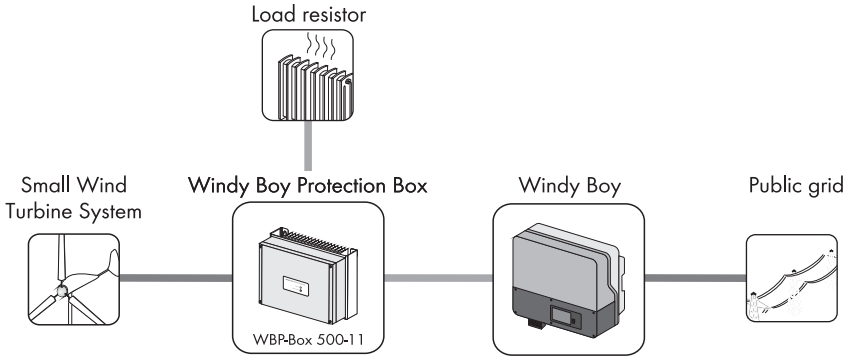
☑ This symbol indicates the result of an action.

2 Safety

2.1 Appropriate Usage

The Windy Boy is a wind power inverter, which converts rectified current of a small wind turbine system into AC current and feeds this energy into the power distribution grid, domestic grid or the Sunny Island system.

Principle of a small wind turbine system with Windy Boy



Furthermore, the Windy Boy can be used as an inverter for power conversion units based on the permanent magnet generators (hydro power systems, combined heat and power plant, diesel generator, etc.). The manufacturer of the small wind turbine system or the generators should have his system set up for operation with the Windy Boy (see also the Windy Boy planning guidelines in the download area at www.SMA.de/en).

SMA Solar Technology AG recommends to operate Windy Boy and a small wind turbine system without neutral grounding.

When designing the system, ensure that the permitted operating range of all components is maintained at all times. Also use appropriate protective measures to make sure that the maximum permissible input voltage of the inverter is not exceeded. Use of the WBP-Box 500-11 Windy Boy Protection Box by SMA Solar Technology AG is obligatory.

Do not use the Windy Boy for purposes other than those described here. Alternative uses, modifications to the Windy Boy or the installation of components not expressly recommended or sold by SMA Solar Technology AG void the warranty claims and operation permission.

2.2 Safety Precautions

DANGER!

Danger to life due to high voltages in the inverter.

- All work on the inverter may be carried out by qualified personnel only.
- The appliance is not to be used by children or persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction.
- Children should be supervised to ensure that they do not play with the appliance.

CAUTION!

Danger of burn injuries due to hot enclosure parts.

During operation, the upper lid of the enclosure and the enclosure body may become hot.

- Only touch the lower enclosure lid during operation.

CAUTION!

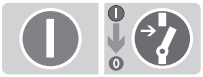
Possible damage to health as a result of the effects of radiation.

- Do not stay closer than 20 cm to the inverter for any length of time.

2.3 Explanation of Symbols

This section contains an explanation of all symbols found on the inverter and type label.

2.3.1 Symbols on the Inverter

Symbol	Explanation
	Operation Display. Indicates the operation condition of the inverter.
	An error has occurred. Read the installation guide and the user manual to remedy the malfunction.
	Bluetooth® Wireless Technology. Shows the status of *Bluetooth* communication.
	Tap to switch on the display light and switch to the next display message.
	I When the Electronic Solar Switch is plugged in, the DC circuit is closed. O To interrupt the DC circuit and disconnect the inverter securely under load , you must release the inverter as described in section 7.2 "Disconnect the device from voltage sources" (page 59).

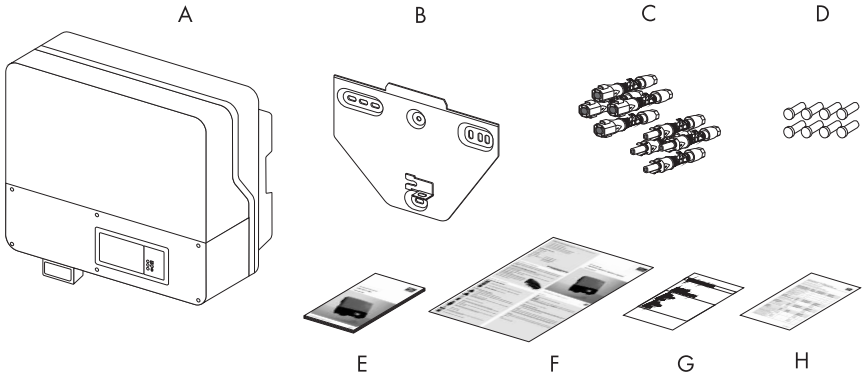
2.3.2 Symbols on the Type Plate

Symbol	Explanation
	Warning: dangerous electrical voltage. The inverter operates at high voltages. Any work on and at the inverter must be carried out by a qualified electrician only.
	Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.
	Observe all documentation that accompanies the inverter.
	The inverter must not be disposed of together with the household waste. For more information on disposal, see section 13.4 "Disposing of the Inverter" (page 84).
	CE mark. The inverter complies with the requirements of the applicable EC guidelines.
	The inverter is transformerless.
	Direct current (DC).
	Alternating Current (AC).
	Protection rating IP54. The inverter is protected against dust deposits in the interior and against splashes of water from all angles.
	RAL quality mark for solar products. The inverter complies with the requirements of the German Institute for Quality Assurance and Labeling.
	Device class label. The inverter is equipped with a wireless component that complies with the harmonized standards.

3 Unpacking

3.1 Packing List

Check the delivery for completeness and any visible external damage. Contact your dealer if anything is damaged or missing.



Object	Number	Description
A	1	Inverter
B	1	Wall mounting bracket
C	8	DC plug connectors (4 x positive / 4 x negative)
D	8	Sealing plugs for DC plug connectors
E	1	Installation Guide
F	1	User Manual
G	1	Set of documents with explanations and certificates
H	1	Supplementary sheet with inverter factory settings

3.2 Identifying the Inverter

You can identify the inverter by the type plate. The type plate is on the right side of the enclosure.

The serial number (Serial No.) and the type (Type / Model) of the product, as well as device-specific characteristics are specified on the type plate.

4 Mounting

4.1 Safety

DANGER!

Danger to life due to fire or explosion.

Despite careful construction, electrical devices can cause fires.

- Do not mount the inverter on flammable construction materials.
- Do not mount the inverter in areas where highly flammable materials are stored.
- Do not mount the inverter in areas with a risk of explosion.

CAUTION!

Danger of burn injuries due to hot enclosure parts.

- Mount the inverter in such a way that it cannot be touched inadvertently during operation.

CAUTION!

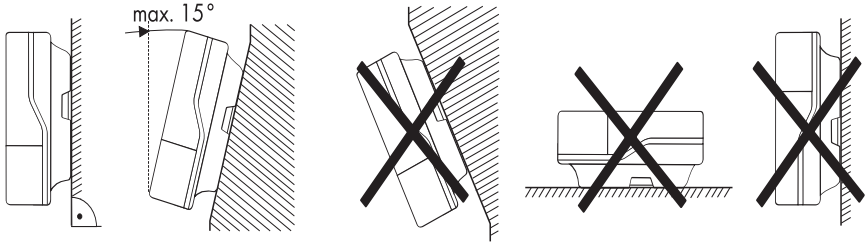
Risk of injury due to the heavy weight of the inverter.

- Remember that the inverter weighs approx. 18 kg.

4.2 Selecting the Mounting Location

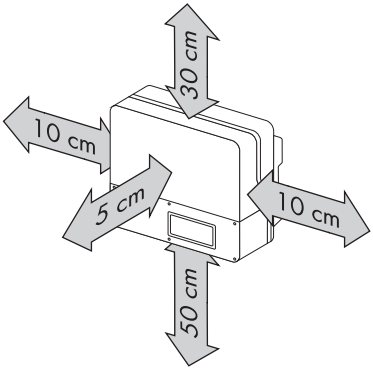
Consider the following points when selecting where to install:

- The mounting method and location must be suitable for the inverter's weight and dimensions (see section 14 "Technical Data" (page 85)).
- Mount on a solid surface.
- The mounting location must at all times be clear and have safe access without the use of additional aids such as scaffolding or lifting platforms. Any possible service actions are otherwise limited.



- Vertical installation or tilted backwards by max. 15°.
- Never mount the device with a forward tilt.
- Do not mount horizontally.
- The connection area must point downward.
- Mount at eye level to allow operating status to be read at all times.
- To ensure optimal operation, the ambient temperature should be below 40 °C.
- Do not expose the inverter to direct sunlight to avoid a power reduction due to excessive heating.
- In a living area, do not mount the unit on plasterboard walls (or similar) in order to avoid audible vibrations. The inverter can make noises when in use, which may be perceived as a nuisance in a living area.

- Observe the minimum clearances to walls, other inverters or objects as shown in the diagram in order to ensure sufficient heat dissipation and sufficient space for the removal of the Electronic Solar Switch.



Multiple inverters installed in areas with high ambient temperatures

There must be sufficient clearance between the individual inverters to ensure that inverters are not subjected to dissipated air from adjacent devices.

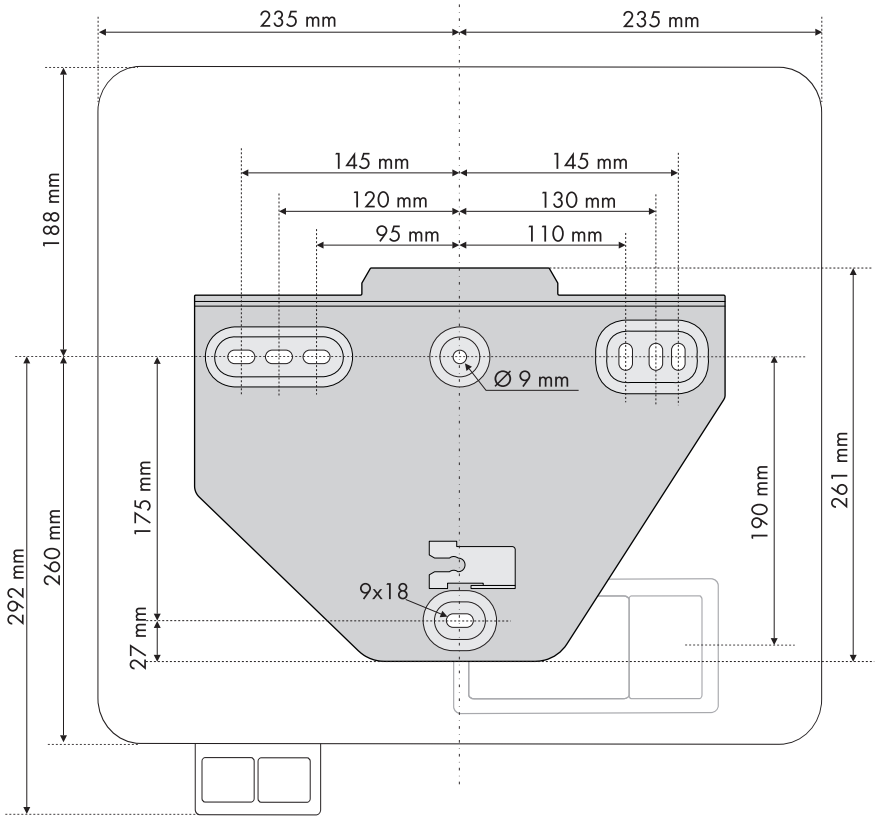
If necessary, increase the clearances and make sure there is enough ventilation to ensure sufficient cooling of the inverters.

4.3 Mounting the Inverter with the Wall Mounting Bracket

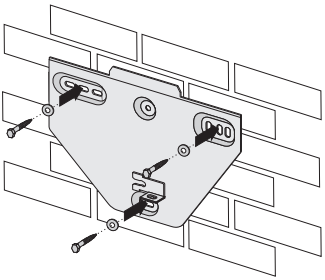
1. Use the wall mounting bracket as a drilling template and mark the positions of the drill holes.

Number of drill holes used

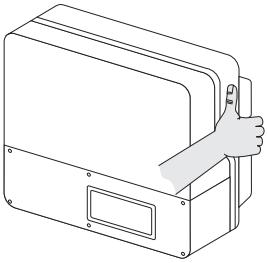
- When mounting on the wall, use one of the top holes on the left and right and the bottom hole in the center.
- Use the two holes in the center when mounting the device to a pillar.



2. Attach the wall mounting bracket to the wall using appropriate screws (diameter min. 6 mm) and washers (outer diameter min. 18 mm).

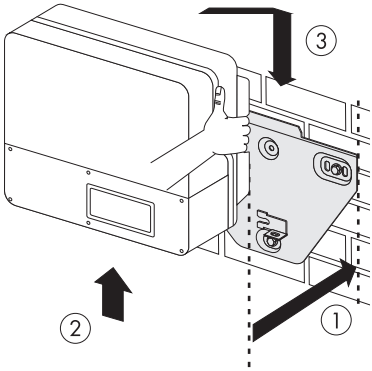


3. Transport the inverter using the handles on the sides.

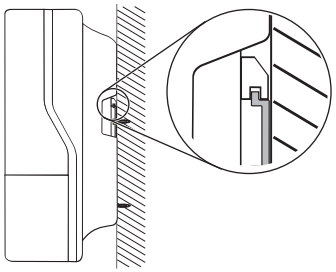


4. Attach the inverter to the wall bracket slightly to the left of its final position.

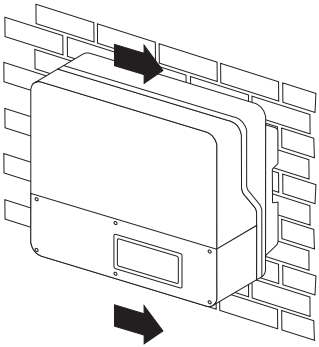
   The right edge of the rear side of the inverter must be flush with the right edge of the wall mounting bracket.



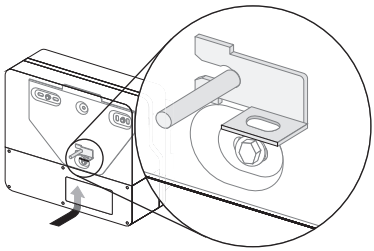
5. Check both sides to ensure that it is correctly in place.



6. Push the inverter to the right on the wall mounting bracket, until it locks into place with the locking bolt on the back wall.



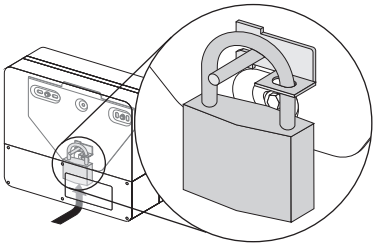
7. Check both sides to ensure that the inverter is correctly in place.



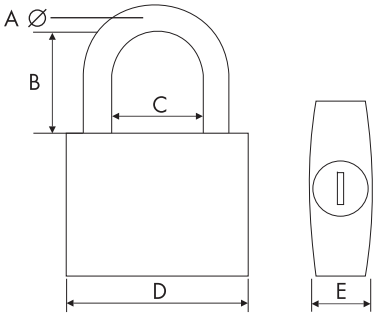
☑ The inverter is now securely mounted to the wall.

Optional Theft Protection

To protect the inverter from theft, you can lock it to the rear panel with a padlock.



The lock must meet the following requirements:



- Size:
  A: 6 mm ... 10 mm diameter
  B: 21 mm ... 35 mm
  C: 20 mm ... 33 mm
  D: 40 mm ... 60 mm
  E: 13 mm ... 21 mm
- Stainless
- Hardened shackle
- Secured lock cylinder

Storage of the key

Keep the key safe in case required for servicing.

Outdoor Installation

Use a padlook suitable for outdoor use. Regularly check the correct function of the padlock.

4.4 Mounting the inverter with a top hat rail

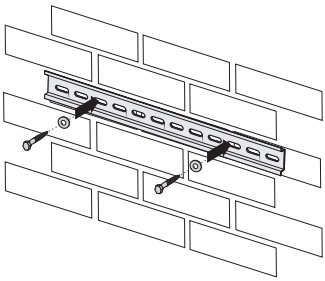
Requirements for installing the top hat rail

- Use a TH-35-7.5 supporting rail compliant with DIN EN 60715.
- Use stainless steel top hat rail and screws to prevent contact corrosion.
- Install on level ground only.
- Use fastening material suitable for the surface. Please observe the weight of the inverter.

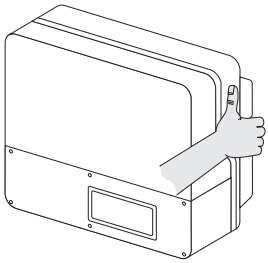
Procedure

1. Use the top hat rail as a drilling template and mark the positions of the drill holes.
2. Attach top hat rail with suitable screws (diameter min. 6 mm) and washers (outer diameter min. 18 mm).

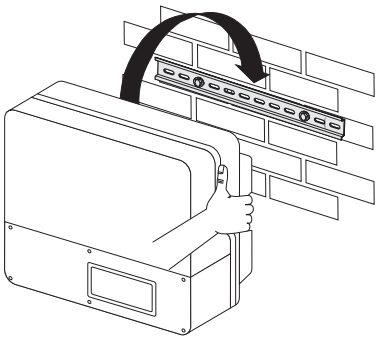
   Use one screw at least every 300 mm.



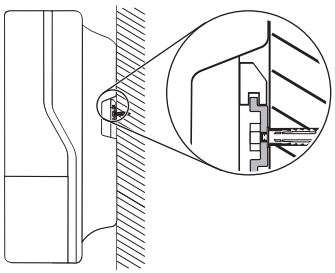
3. Transport the inverter using the handles on the sides.



4. Suspend the inverter on the top hat rail using the opening on its rear wall.



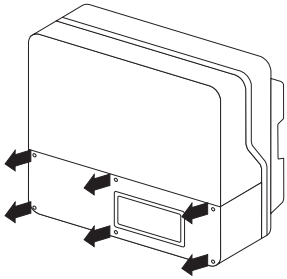
5. Check both sides to ensure that it is correctly in place.



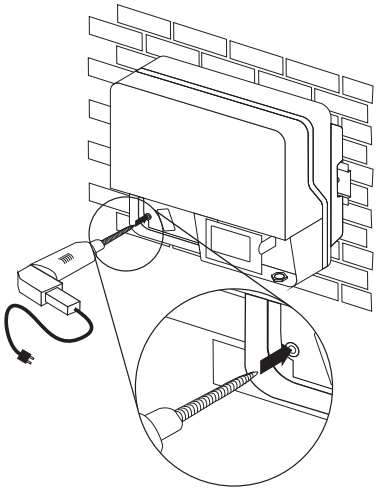
Securing the Inverter Against Excavation

Additionally secure the inverter in the wall using screws.

1. Remove the Electronic Solar Switch towards the bottom.
2. Loosen all six captive screws and remove lid.



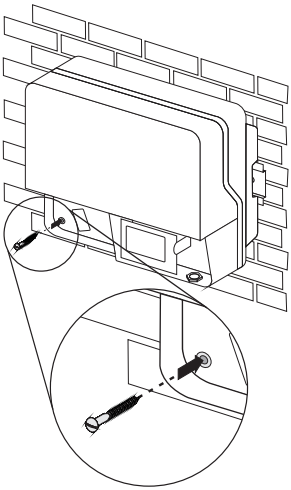
3. Drill through the back wall of the enclosure.
4. Use a suitable drill bit at least 120 mm in length.
5. Insert suitable wall anchor.



6. Fasten the inverter.

   The screw must meet the following requirements:

Length:	min. 100 mm
Diameter:	8 mm
Screw head:	Hex screws or slotted screws not countersunk



☑ The inverter is protected against excavation.

5 Electrical Connection

5.1 Safety

WARNING!

Electric shock resulting from short circuit.

If cables with a different voltage are routed in parallel, there is the risk of a short circuit in the event of damage to the cable insulation.

- Route all cables separately.

CAUTION!

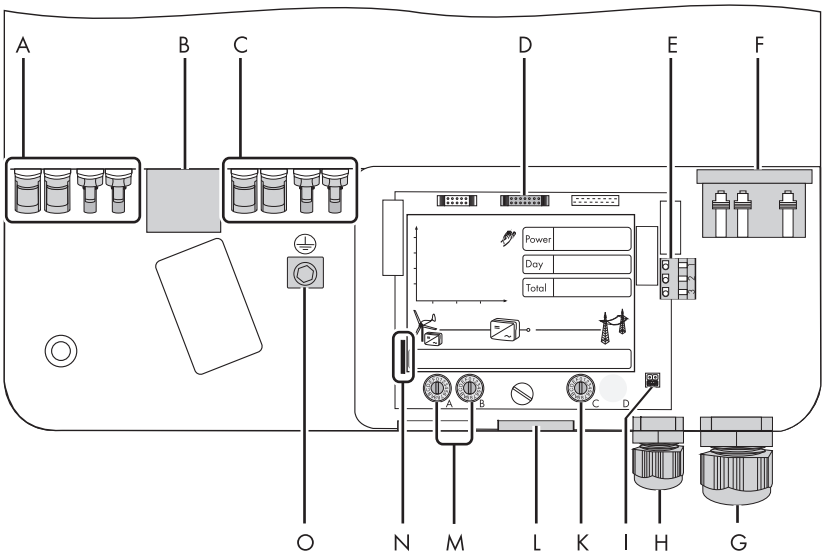
Electrostatic discharges can damage the inverter.

Internal components of the inverter can be irreparably damaged by static discharge.

- Ground yourself before touching a component.

5.2 Overview of the Connection Area

The following figure shows the assignment of the individual connection areas, openings in the housing and cable glands of the inverter.



Object	Description
A	Input area A: DC plug connectors to connect Windy Boy Protection Box (WBP-Box 500-11)
B	Electronic Solar Switch (ESS) socket
C	Input area B: DC plug connectors to connect Windy Boy Protection Box (WBP-Box 500-11)
D	Connector for optional communication via RS485
E	Terminal for multi-function relay
F	Terminals for grid connection (AC)
G	Cable gland for grid connection (AC) (12 mm ... 25 mm)
H	Cable gland for connection to multi-function relay (6 mm ... 12 mm)
I	Jumper slot for setting the language to English
K	Rotary switch for the configuration of *Bluetooth* communication
L	Housing opening for optional communication via RS485
M	Rotary switch to set the country of installation and the display language
N	Slot for the SD card
O	Ground terminal to additionally ground the inverter

5.3 Connection to the Power Distribution Grid (AC)

5.3.1 Conditions for the AC Connection

Observe all connection conditions of the utility operator for connecting to the power distribution grid!

Residual current breaker

The inverter is equipped with an integrated universal current sensitive residual-current monitoring unit. The inverter can automatically differ between real fault currents and "normal" capacitive leakage currents.

If an external RCD or residual current breaker is strictly required, you must use a switch that triggers at a failure current of 100 mA or higher.

Cable Sizing

The grid impedance of the AC cable must not exceed 1 Ohm. Otherwise, the inverter will disconnect at full feed capacity due to excessive voltage at the feed-in point.

The wire cross-section should be dimensioned so output losses do not exceed 1 % at nominal power.

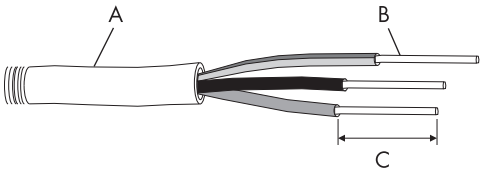
The maximum cable lengths depending on the wire diameter are displayed in the following table.

Cross section of insulated conductor	Maximum wire length	
	WB 3600TL	WB 5000TL
6.0 mm²	23.3 m	18.6 m
10.0 mm²	38.8 m	31.1 m

The conductor cross-sectional area required in individual cases depends on the following factors, among others:

- Ambient temperature,
- Routing method,
- UV resistance,
- Conduction losses,
- valid installation requirements of the respective country (installation location).

Cable requirements



Object	Description	value
A	External diameter	12 mm ... 25 mm
B	Cross section of insulated conductor	max. 10 mm²
C	Strip insulation	Approx. 12 mm

Load Disconnection Unit

You must install a **separate** line circuit breaker for each inverter in order to ensure that the inverter can be securely disconnected under load. The maximum permissible rating is located in section 14 "Technical Data" (page 85).

Detailed information and examples for the rating of a line circuit breaker can be found in the Technical Information "Line Circuit Breaker" in the SMA Solar Technology AG download area at www.SMA.de/en.

DANGER!

Danger to life due to fire.

When more than one inverter is connected to the same line circuit breaker, the protective function of the line circuit breaker is no longer guaranteed. It can result in a cable fire or the destruction of the inverter.

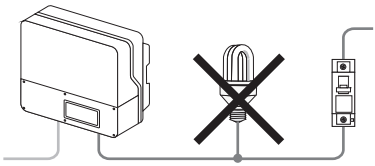
- Never connect several inverters to the same line circuit breaker.
- Comply with the maximum permissible fuse protection of the inverter when selecting the line circuit breaker.

DANGER!

Risk of electric shock.

When a generator (inverter) and a consumer are connected to the same line circuit breaker, the protective function of the line circuit breaker is no longer guaranteed. The current from the inverter and the grid can accumulate to overcurrent, which is not detected by the line circuit breaker.

- Never connect consumers between the inverter and the line circuit breaker without protection.
- Always protect consumers separately.



CAUTION!

Damage to the inverter by using screw type fuse elements as a load disconnection unit.

A screw type fuse element, e.g. D system (Diazed) or D0 system (Neozed) is not a circuit breaker, and may **not** be used as a load disconnection unit. A screw type fuse element is only used as cable protection.

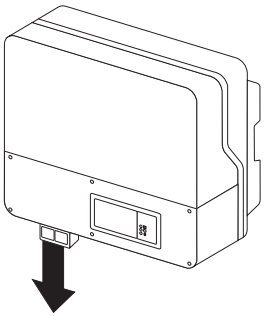
When disconnecting under load using a screw type fuse element, the inverter can be damaged.

- Use only a load disconnection switch or a line circuit breaker as a load disconnecting unit.

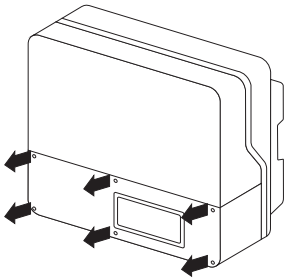
5.3.2 Connecting the Inverter to the Power Distribution Grid (AC)

1. Check that the grid voltage is within the admissible voltage range.

   The exact operating range of the inverter is specified in the operating parameters. The corresponding document is located in the download area at www.SMA.de/en, in the "Technical Description" category of the respective inverter.
2. Disconnect the line circuit breaker and secure against re-connection.
3. Ensure that the small wind turbine system is stopped and secured so it will not restart.
4. Remove the Electronic Solar Switch.



5. Loosen all six captive screws and remove lid.

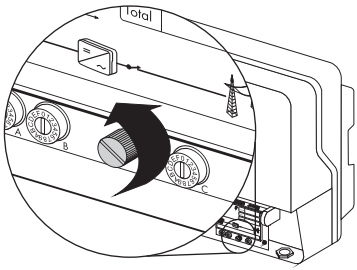


6. Check whether the inverter has been set to the correct country standard using the rotary switch.

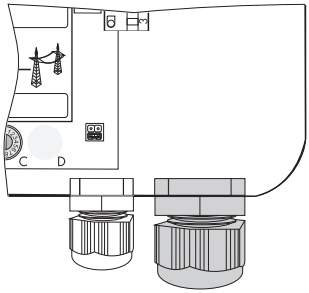
   Please refer to section 5.5.1 "Checking the Country Standard" (page 40) for an overview of switch positions for country standards and the display language. Factory settings of the inverter are provided on the supplied supplementary sheet.
7. If the inverter is not set to the desired country standard, then adjust the country standard as described in section 5.5.2 "Setting the Country Standard and Language using Rotary Switches" (page 43).

8. Loosen the screw if the display until it can be flipped upward to facilitate connection.

   Flip up the display until it clicks into place.

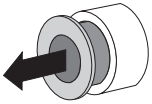


9. Undo the lock not of the AC cable gland and remove the filler plug from the cable gland.



Seal in the AC cable gland

There is a two-part seal in the cable gland. Remove the inner insert of the seal if required. This is necessary to route a thicker cable.



The following guideline values apply:

- Cable diameter with seal and insert: 12 mm ... 16 mm
- Cable diameter with seal without insert: 15 mm ... 21 mm

10. Pull the cable through.
11. Open all AC terminals.

CAUTION!

Risk of fire when connecting two wires to one terminal.

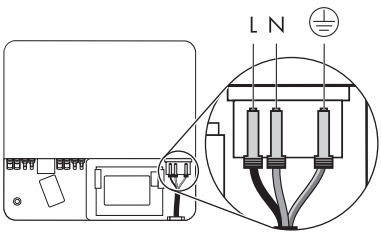
If 2 wires are connected to one terminal, a poor electrical contact can result in overheating or a risk of fire.

- Never connect more than one conductor per terminal.

12. Connect L, N and protective conductor (PE) to the AC terminal in accordance with the labels.

    To do this, the insulated PE conductor must be 5 mm longer than the insulated L and N conductors!

    L and N must not be swapped.



CAUTION!

Danger of crushing when terminals snap shut.

The terminals close by snapping down fast and hard.

- Press the terminals down with your thumb, do not grip the entire terminal on all sides.
- Keep fingers away from the terminals.

13. Close all terminals of the AC terminal again until they snap into place.
14. Fold display down again and screw in place.
15. Tighten the lock nut firmly to the cable gland.

DANGER!

Danger to life due to high voltages in the inverter.

- Do not switch on the line circuit breaker until the small wind turbine system has been connected and the inverter is securely closed.

☑ The inverter is now connected to the power distribution grid (AC).

5.3.3 Additional Grounding of the Housing

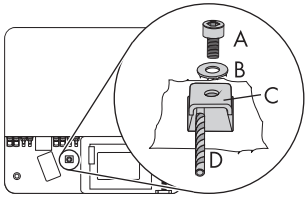
If a second protective conductor connection is required in the country of installation, you can also ground the inverter using a second protective conductor on the connection terminal on the enclosure.

Procedure

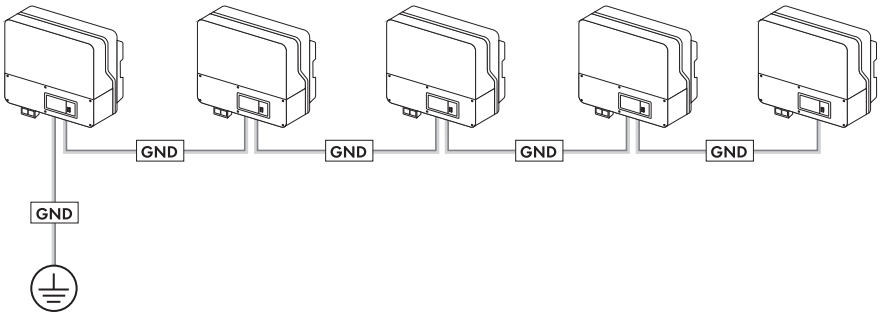
1. Undo screw (A) by half way.
2. Insert the stripped grounding cable (D) under the clamping clip (C) (max. cross-section 16 mm²).
3. Fasten terminal (C).

   The toothing of the lock washer (B) must face toward the terminal clamp.

☑ The inverter's enclosure is additionally grounded.



You can ground several inverters as shown below:



5.4 Connecting Windy Boy Protection Box (DC)

5.4.1 Conditions for the DC Connection

CAUTION!

Destruction of the inverter by overvoltage.

If the voltage of the small wind turbine system exceeds the maximum input voltage of the inverter, it can be destroyed by the overvoltage. All warranty claims become void.

- Exclusively connect a type "WBP-Box 500-11" Windy Boy Protection Box to the inverter.

- The following limit values at the DC input of the inverter may not be exceeded:

maximum input voltage	Maximum input current	
	Input area A	Input area B
550 V	15 A	15 A

- Connection cables of the Windy Boy Protection Box must be equipped with plug connectors to connect them to the inverter. The required DC plug connectors are included in delivery.

DANGER!

Risk of lethal electric shock or fire.

The maximum possible input current is limited by the plug connectors used. If the plug connector is overloaded, an electric arc may occur and there is a fire risk.

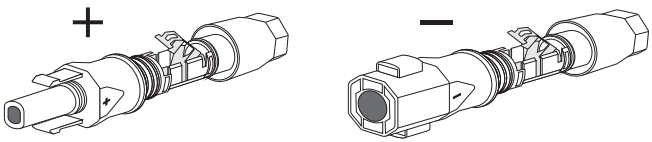
- Ensure that the input current does not exceed the maximum flow current of the plug connectors used.

- The inverter has two input areas "A" and "B" that work with one working point. Connect one positive terminal and one negative terminal to each of the two input areas of the Windy Boy Protection Box (WBP-Box 500-11). See section 5.4.4 "Connecting the Windy Boy Protection Box (DC)" (page 37).
- This inverter is **not** suitable for connection to the DC power grid.
- Do not connect the inverter to a DC source with a cable longer than 30 m.

5.4.2 Assembling the DC Plug Connector

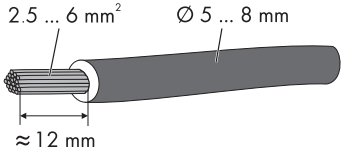
Connection cables of the Windy Boy Protection Box (WBP-Box 500-11) must be equipped the included with DC plug connectors to connect them to the inverter.

To assemble the DC plug connectors, proceed as detailed below. Ensure the plug connectors have the correct polarity. The DC plug connectors have the symbols "+" and " – ".



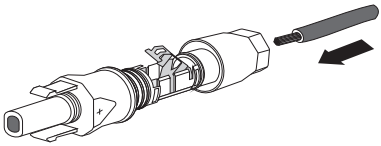
Cable requirements:

- Use a PV1-F cable.

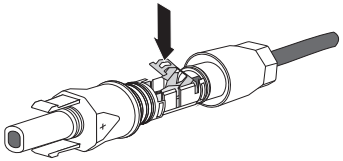


Procedure

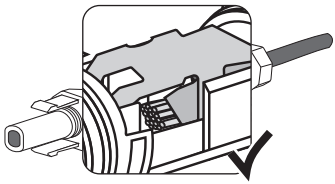
1. Insert stripped cable into the plug up to the limit.

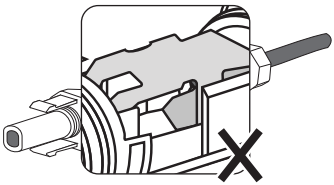
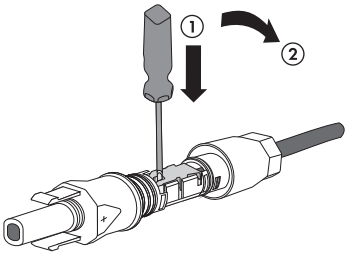


2. Press the clamping clip down until it audibly snaps into place.

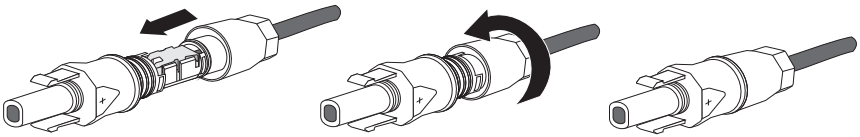


3. Ensure the cable is correctly in place:

Result	Action
☑ If the conductors are visible in the hollow cavity of the clamping clip, the cable is in the correct position. 	• Proceed to step 4.

Result	Action
☑ If the conductor is **not** visible in the hollow cavity, the cable is not in the correct position. 	• Loosen the clamping clip using a screwdriver.  • Remove cable and start again from step 1.

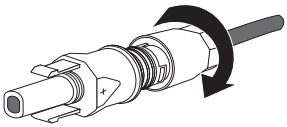
4. Push the threaded joint to the thread and screw into place.



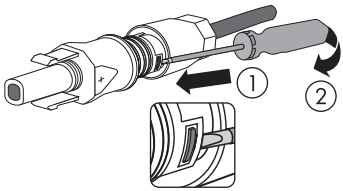
☑ The DC plug connectors are now assembled and can be connected to the inverters, as described in section 5.4.4 "Connecting the Windy Boy Protection Box (DC)" (page 37).

5.4.3 Opening the DC Plug Connector

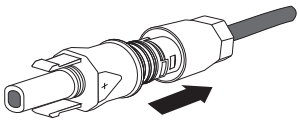
1. Screw the threaded joint off.



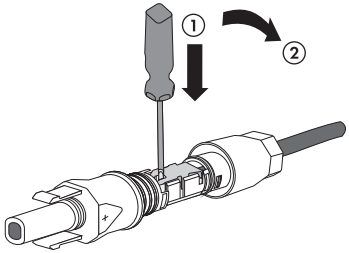
2. To release the plug connector, slot a screwdriver into the side catch mechanism and lever out.



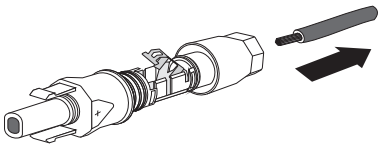
3. Carefully pull the DC plug connector apart.



4. Loosen the clamping clip using a screwdriver.



5. Remove the cable.



☑ The cable is now removed from the DC plug connector.

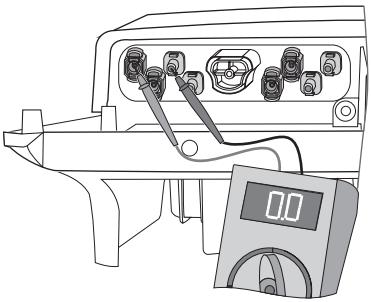
5.4.4 Connecting the Windy Boy Protection Box (DC)

DANGER!

Danger to life due to high voltages in the inverter.

- Before connecting the Windy Boy Protection Box (WBP-Box 500-11), ensure that the small wind turbine system connected to the Windy Boy Protection Box has been stopped and secured against restart.

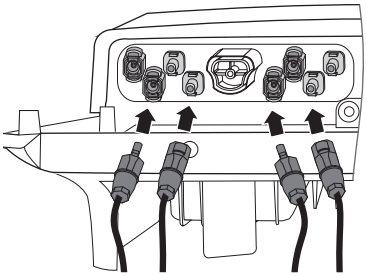
1. Check the DC plug connectors for correct polarity.



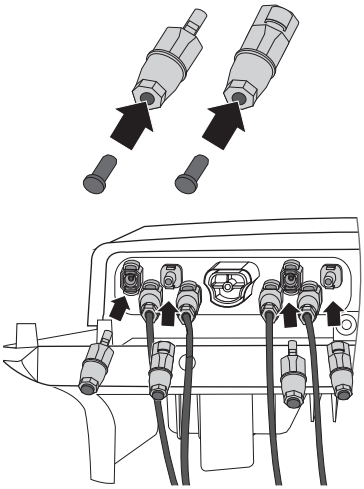
2. Connect one positive and one negative DC plug connector each to both input areas of the inverter.

   To release the DC plug connectors see section 7.2 "Disconnect the device from voltage sources" (page 59).

   Never connect all 4 DC plug connectors to only one input area!



3. To create the seal on the inverter, all DC inputs that are not required must be closed as follows:
   - Insert the sealing plugs provided into the DC plug connectors that are not needed. **Do not** insert the blank plugs into the DC inputs on the inverter.
   - Insert the DC plug connectors with sealing plugs into the corresponding DC inputs on the inverter.



☑ Windy Boy Protection Box has been connected.

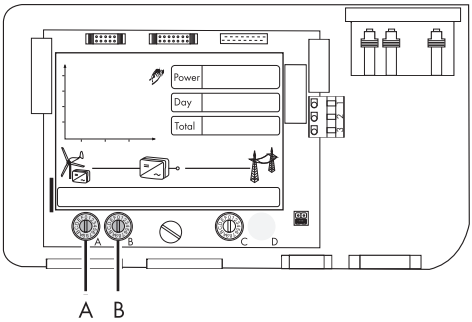
You can now commission the inverter as described in section 6 "Initial start-up" (page 50). The following connection options are optional.

5.5 Setting the Country Standard and Display Language

The inverter can be configured for various countries. This can be done via two rotary switches in the inverter prior to commissioning or by configuring the "CntrySet" and / or "Set country standard" parameter using a communication device (e.g. Sunny WebBox or Sunny Explorer) after you have commissioned the inverter.

The switch position 0 / 0 indicates the delivered state. If you have ordered the inverter with specific country settings, these will have already been preset in the factory via a communication device. In this case, you will not be able to recognize the setting by the switch position. If changes are made via the rotary switches or via a communication device, these settings will be overwritten and cannot be easily restored. For devices ordered without any specified country of installation, the standard setting is "VDE0126-1-1" and the language is German.

Changes will be immediately accepted after switching the line circuit breaker on. If an un-programmed switch setting is selected, the inverter issues an error message.



Grid Guard Protected Country Data Sets

In some countries, the local power supply line requirements demand a mechanism which prevents the parameters for grid feeding from being able to be changed. Some country data sets are therefore protected and can only be unlocked with a personal access code, the so-called SMA Grid Guard Code.

Country data sets protected by Grid Guards are blocked automatically 10 feed-in hours after commissioning or the last modification. If the country data set is changed after these 10 feed-in hours, the inverter will not accept the changes and displays the error message "Grid parameter locked". If, however, a later change to the country data set only relates to a change of the display language, this change is immediately taken on.

It is also possible to set country data sets (parameter "CntrySet" and / or "Set country standard"), and to lock or unlock these manually via a communication device. To lock, you have to set the Grid Guard Code to "54321". This will automatically appear as an input window when changing the first grid-relevant parameter. The data set can only be unlocked by entering a personal, 10-digit SMA Grid Guard Code which is valid for a maximum of 10 grid-feed hours. The application form for the personal access code is located in the download area at www.SMA.de/en, in the "Certificate" category for each inverter. The language is configurable without a password independent of the country data set.

Changing of parameters in grid guard protected country data sets

If the parameters within protected country data sets are changed, these are no longer protected and instead of the standard, "ADJ" or "Special setting" is displayed. In this case, the parameters are not changed automatically after 10 grid-feed hours, but have to be manually locked. To manually lock the parameters, set the SMA Grid Guard Code to "54321".

Further information on parameter settings

Detailed information on how to proceed with respect to setting and changing parameters is available in the respective user manual for your software.

The last change (executed via switch or communication device) is always verified and activated if applicable. Consequently, the switch position may not necessarily show the actual country configuration.

5.5.1 Checking the Country Standard

Check whether the inverter is set to the installation country.

1. Check that the country standard is correct on the basis of the display message during (re-)commissioning (see section 6 "Initial start-up" (page 50) or section 8 "Restarting the system" (page 62)) or by means of the "SMA grid guard" measuring channel via a communication device.
2. If necessary, change the setting via the parameter "CntrySet" and / or "Set country standard" using the communication device or the rotary switches (see section 5.5.2 "Setting the Country Standard and Language using Rotary Switches" (page 43)) according to the following table.

Display language

Once you have set the country standard, you can set the display language at any time using rotary switch B. However, you have to then set the rotary switch A to "0" in order to keep the country data set.

The settings of each country data set are specified in the operation parameters. The parameters can be read out using a communication device. The description of the operating parameter is available in the download area at www.SMA.de/en in the category "Technical Description" of the respective inverter.

(A)	(B)	Country data set	Display language	Grid guard protection	Country
0	0	Delivery state	Delivery state	Dependent on parameter set	Dependent on parameter set
0	1	Retained	English	Dependent on parameter set	Dependent on parameter set
0	2	Retained	German	Dependent on parameter set	Dependent on parameter set

(A)	(B)	Country data set	Display language	Grid guard protection	Country
0	3	Retained	French	Dependent on parameter set	Dependent on parameter set
0	4	Retained	Spanish	Dependent on parameter set	Dependent on parameter set
0	5	Retained	Italian	Dependent on parameter set	Dependent on parameter set
0	6	Retained	Not programmed**	Dependent on parameter set	Dependent on parameter set
0	7	Retained	Not programmed**	Dependent on parameter set	Dependent on parameter set
1	0	VDE0126-1-1	German	Yes	Germany, Switzerland,
1	1	VDE0126-1-1 A [a)]	German	Yes	Germany
1	8	VDE0126-1-1	French	Yes	Switzerland, France
1	9	VDE0126-1-1 B [b)]	French	Yes	France
2	0	VDE0126-1-1	Italian	Yes	Switzerland
2	8	AS4777	English	no	Australia
3	0	DK5940E2.2	Italian	no	Italy
3	8	DK5940E2.2	German	no	Italy
4	0	RD1663	Spanish	Yes	Spain
4	8	PPC	Not programmed**	no	Greece
4	9	PPC*	English	no	Greece
5	0	Kepco guide	English	no	South Korea
5	8	G 83/1	English	no	England
6	0	EN 50438	German	Yes	various EU countries
6	1	EN 50438	English	Yes	various EU countries
6	2	EN 50438	French	Yes	various EU countries
6	3	EN 50438	Italian	Yes	various EU countries
6	4	EN 50438	Spanish	Yes	various EU countries
6	5	EN 50438	Not programmed**	Yes	various EU countries

(A)	(B)	Country data set	Display language	Grid guard protection	Country
6	6	EN 50438	Not programmed**	Yes	various EU countries
7	0	EN50438-CZ	Not programmed**	Yes	Czech Republic
7	1	EN50438-CZ	English	Yes	Czech Republic
7	2	EN50438-CZ	German	Yes	Czech Republic
7	8	C10/11*	French	Yes	Belgium
7	9	C10/11*	English	Yes	Belgium
7	A	C10/11*	German	Yes	Belgium
E	0	Off-grid 60 Hz	English	no	Flexibility
E	1	Off-grid 60 Hz	German	no	Flexibility
E	2	Off-grid 60 Hz	French	no	Flexibility
E	3	Off-grid 60 Hz	Spanish	no	Flexibility
E	4	Off-grid 60 Hz	Italian	no	Flexibility
E	5	Off-grid 60 Hz	Not programmed**	no	Flexibility
E	6	Off-grid 60 Hz	Not programmed**	no	Flexibility

a) Special setting: parameter "VolCtl.Rpro" or "Voltage increase protection" = 244 V instead of 253 V

b) Special setting: *Bluetooth* transmission power reduced (in accordance with French standards)

*) Availability on request

**) Currently unavailable. The previously configured display language remains set.

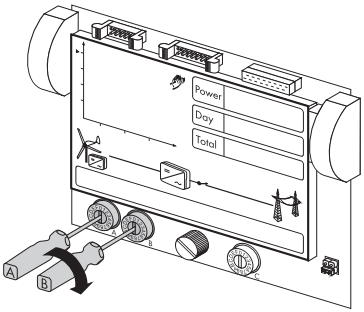
Should the inverter not be set to the installation country, configure it using the 2 rotary switches as described in section 5.5.2 "Setting the Country Standard and Language using Rotary Switches" (page 43).

Alternatively you can adjust the settings via the parameter "CntrySet" and / or "Set country standard" using a communication device.

If you require adjusted parameter settings for you installation location, you can change these using a communication device.

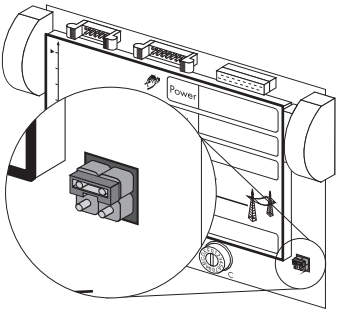
5.5.2 Setting the Country Standard and Language using Rotary Switches

1. Disconnect the inverter as described in section 7 "Disconnecting the Inverter" (page 59).
2. Set the arrows on both rotary switches (A and B) using a screw driver (2.5 mm) to the desired positions (see table in section 5.5.1 "Checking the Country Standard" (page 40)).



Jumper for English language

You can also set the language to English by means of a jumper (e.g. for service purposes in other countries). To do so, plug the jumper onto the upper two pins as shown on the right.



3. Re-commission the inverter as described in section 8 "Restarting the system" (page 62).

5.6 Communication

Communication via *Bluetooth* with a communication device is activated as standard. Networking via *Bluetooth* with other inverters is deactivated ex works.

The following setting options are possible via a rotary switch.

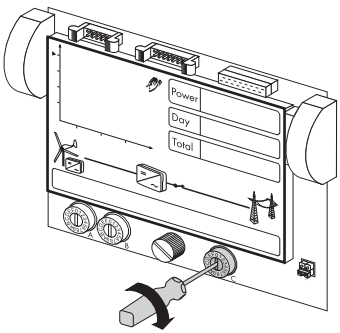
Switch position (NetID)	Setting
0	Off
1	Communication via *Bluetooth* with communication device possible, no networking with other inverters (factory setting)
2 ... F	Networking with other inverters

In order to restrict communication via *Bluetooth* between the inverters of your system and those of neighboring systems, you can assign an individual NetID to the inverters of your system (switch position 2 ... F). This, however, is only necessary if neighboring systems are within a radius of 500 m.

So that all inverters in your system are detected by your communication device, all inverters must have the same NetID.

Procedure

1. Disconnect the inverter as described in section 7.2 "Disconnect the device from voltage sources" (page 59).
2. Set the arrow on the rotary switches to the required position using a screwdriver (2.5 mm).



3. Re-commission the inverter as described in section 8 "Restarting the system" (page 62).

Acceptance of settings

The *Bluetooth* settings will only be activated after the line circuit breaker has been switched on, the Windy Boy Protection Box connected and the Electronic Solar Switch plugged in.

5.6.1 Multi-function relay

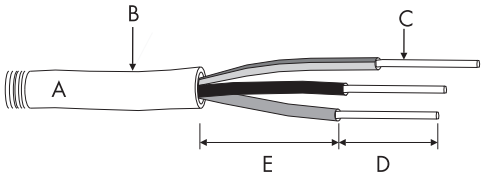
The inverter is equipped with a multi-function relay as standard. This can be activated, for instance, simultaneously with the red error LED beside the display. Other functions are being planned can be later retrofitted via a firmware update.

Here you can connect separate loads both in the event of errors and for trouble-free operation.

The following table gives you the maximum permissible voltages and currents:

	Voltage	Current
AC	max. 240 V	max. 1.0 A
DC	max. 30 V	max. 1.0 A

Cable requirements



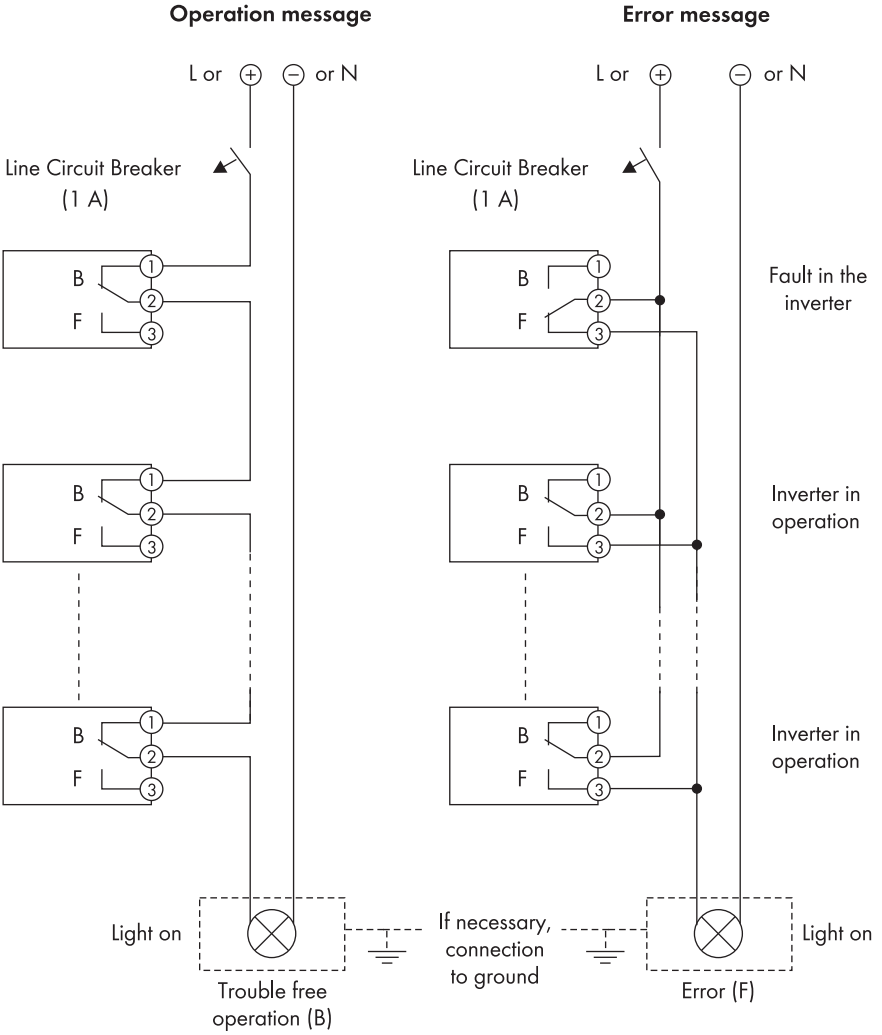
Position	Description	Value
A	Cable type	Double insulated
B	External diameter	5 mm ... 12 mm
C	Cross section of insulated conductor	0.08 mm² ... 2.5 mm²
D	Strip insulation	max. 8 mm
E	Stripping length	max. 15 mm

The cable type and cable-laying method must be appropriate to the application and location.

Line circuit breaker

If you are connecting the multi-function relay to the public grid, it must be protected with a separate line circuit breaker.

Connection plan

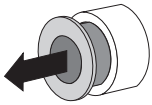


Procedure

1. Disconnect the inverter as described in section 7.2 "Disconnect the device from voltage sources" (page 59).
2. Undo the lock nut of the cable gland a little and remove the filler plug from the cable conduit.

Seal in the cable gland

There is a two-part seal in the cable connection. Remove the inner insert of the seal, if required. This is required to route a thicker cable.



The following guideline values apply:

- Cable diameter with seal and insert: 5 mm ... 7 mm
- Cable diameter with seal and without insert: 7 mm ...13 mm

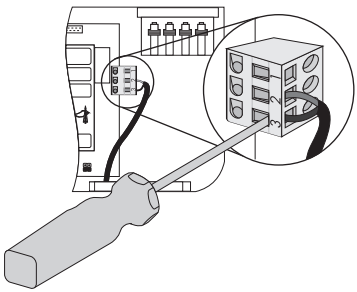
DANGER!

Danger to life due to high voltages in the inverter.

- Use only cables that have been insulated several times.
- Remove a max. of 15 mm cable sheath.

3. Pull the cable through.
4. Strip a max. of 8 mm off the insulated wires.
5. Connect wires to the terminal using a screwdriver.

   The connection plan shows where the wires must be connected, depending on whether you require an operating or an error message.



6. Tighten the lock nut firmly to the cable gland.
7. Re-commission the inverter as described in section 8 "Restarting the system" (page 62).
8. Switch on supply voltage.

☑ The multifunction relay is now operational.

5.6.2 Communication module

The inverter can be equipped with a communication module in order to engage in wire-linked communication with special data acquisition devices (e.g. Sunny WebBox) or a PC with corresponding software (e.g. Sunny Data Control).

A detailed circuit diagram and installation description can be found in the communication module manual.

5.6.3 Polynomial Characteristic Curve

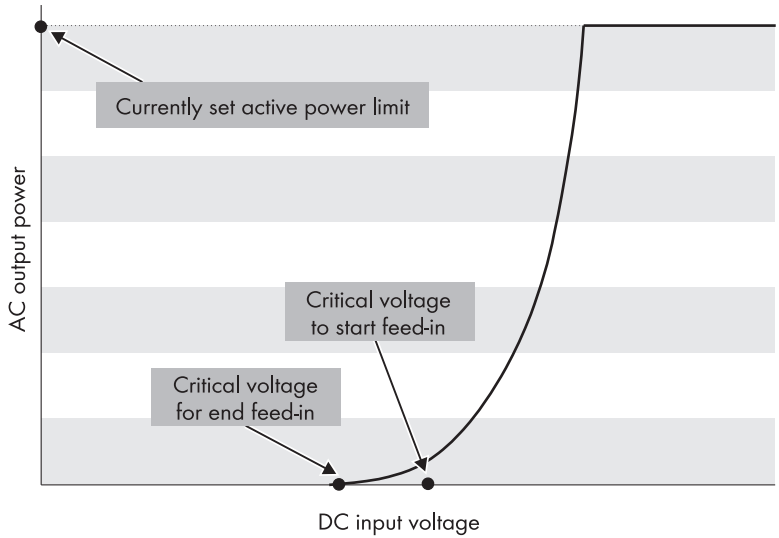
The polynomial characteristic curve is a programmable power curve depending on the DC input voltage. By adapting the default polynomial characteristic curve to the small wind turbine system being used, you can optimize the energy output of the small wind turbine system.

To optimally adapt the polynomial characteristic curve of the inverter to the wind turbine system being used, you can change the following parameters on the PC with the "Sunny Explorer" software (www.SMA.de/en/Products/Software):

- Critical voltage to start feed-in
- Critical voltage for end feed-in
- Power characteristic curves coefficient for Udc^0 ...
  Power characteristic curves coefficient for Udc^3
- Currently set active power limit
- Power controller settings kp component
- Power controller settings ki component
- Power controller settings kd component
- Deactivation delay

A description of the operating parameter is available in the download area at www.SMA.de/en in the category "Technical Description" of the respective inverter.

The inverter regulates its output power according to the generator voltage. The following illustration shows the function of a typical polynomial characteristic curve of a WB 3600TL / WB 5000TL. Here, the fed-in AC power is shown according to the DC input voltage of the inverter.



6 Initial start-up

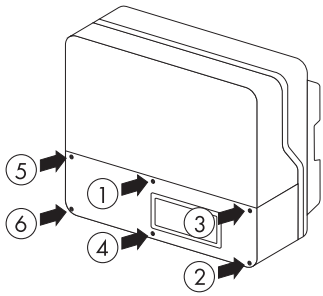
Self test in accordance with DK 5940, Ed. 2.2 for initial start-up (applies to Italy only)

The Italian DK 5940 standard requires that an inverter must only be connected to the public grid if the disconnection times for overvoltage, undervoltage, minimum frequency and maximum frequency have been checked.

If you have configured country standard DK5940E2.2, start the self-test as described in section 6.1 "Self-test according to DK 5940, ED. 2.2 (for Italy only)" (page 52). The test takes approx. 3 minutes.

1. Check the following requirements before commissioning:
   - Correct mounting and correct connection of the inverter
   - The Windy Boy Protection Box (WBP-Box-500-11) is installed between small wind turbine system and inverter
   - Unnecessary DC inputs are closed with the corresponding DC plug connectors and sealing plugs
   - The line circuit breaker is laid out correctly
   - Correct country configuration
   - Correct grounding of the small wind turbine system in accordance with the instructions of the manufacturer
   - All housing passages are closed
2. Lock the bottom housing lid with the 6 screws.

   Tighten the screws with 1.4 Nm torque in the order shown in the figure on the right.

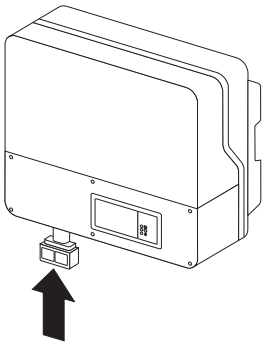


CAUTION!

The Electronic Solar Switch can be damaged if it is inserted incorrectly.

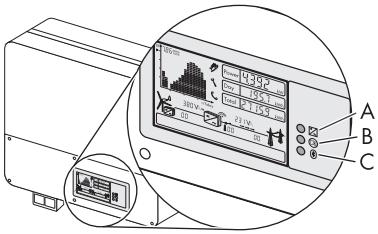
- Firmly connect the Electronic Solar Switch.
- Check firm position of the Electronic Solar Switch.

  The handle of the Electronic Solar Switch must be flush with the housing.



3. Switch on the line circuit breaker.
4. Commission the small wind turbine system in accordance with the instructions of the manufacturer.
5. If available, connect the supply voltage of the multi-function relay.
6. Check whether the display and LEDs are indicating a normal operating state.

LED	Color	Description
A	Green	Glowing: operation
		Flashing: network connection conditions not yet reached. The inverter only switches to network if the conditions are met.
B	Red	Disturbance
C	Blue	*Bluetooth* communication is active



☑ Successful commissioning is indicated by a glowing or blinking green LED.

The meaning of the illuminated red LED and the meaning of the event numbers on the display are described in section 11.2 "Error Messages" (page 71).

6.1 Self-test according to DK 5940, ED. 2.2 (for Italy only)

6.1.1 Starting the Self-Test by Tapping

You can start the self-test by tapping on the enclosure lid. Prerequisite here is that the country configuration of the inverter has been set to Italy (DK5940E2.2) or a reconfiguration based on the DK5940E2.2 country standard DK5940E2.2 has been performed. In addition, an undisturbed feed-in operation must be possible.

Display Language during the Self-Test

Independent of the configured language (German or Italian), the display messages for the self-test will always be displayed in Italian.

Procedure

1. Commission the inverter as described in section 6 "Initial start-up" (page 50).

   ☑ The inverter is now in the initialization phase.

   - Firstly, the firmware version of the internal processors appears in the text lines.
   - After 5 seconds or after tapping the enclosure lid, the serial number or the description of the inverter appears. The description of the inverter can be changed with a communication device.
   - After a further 5 seconds, or when you tap again, the configured standard is displayed.

2. In order to start the self-test, tap the enclosure lid **within 10 seconds**.

   ☑ The message shown on the right appears in the display.

3. Now activate the self-test **within 20 seconds** by tapping on the enclosure lid again.

☑ Once you have started the test sequence, the inverter checks the disconnection times for overvoltage, undervoltage, maximum frequency and minimum frequency on after the other. During the tests, the inverter shows the values in the display which are described in section 6.1.2 "Test Sequence" (page 53). When the inverter has carried out the 4 tests, it switches to normal operation. The original calibration values are reset.

6.1.2 Test Sequence

Note the values which are displayed during the test sequence. These values must be entered into a test protocol. The test results of the individual tests are displayed 3 times one after the other.

Current values in the Display

During the self-test the actual voltage, the feed-in current and the frequency is displayed above the text rows independent of the test values.

Overvoltage Test

The inverter begins with the overvoltage test and shows the adjacent display message for 5 seconds.

During the test sequence, the voltage limit applied is shown in the display of the inverter. The voltage limit is reduced successively until the shut-down threshold is achieved and the inverter disconnects from the grid.

Once the inverter has disconnected from the grid, the display successively shows the following values, each for 10 seconds:

- Disconnection value,

1.

2.

- Calibration value,

1.

2.

- Reaction time.

1.

2.

The change between the first and second display takes places every 2.5 seconds.

Undervoltage Test

The undervoltage test follows the overvoltage test and the inverter issues the adjacent display message for 5 seconds.

During the test sequence, the voltage limit applied is shown in the display of the inverter. The voltage limit is increased successively until the shutdown threshold is reached and the inverter disconnects from the grid.

Once the inverter has disconnected from the grid, the display successively shows the following values, each for 10 seconds:

- Disconnection value,

1.

2.

- Calibration value,

1.

2.

- Reaction time.

1.

2.

The change between the first and second display takes places every 2.5 seconds.

Maximum Frequency

The maximum frequency test follows the undervoltage test and the inverter issues the adjacent display message for 5 seconds.

During the test sequence, the frequency limit applied is shown in the display of the inverter. The frequency limit is reduced successively until the shutdown threshold is reached and the inverter disconnects from the grid.

Once the inverter has disconnected from the grid, the display successively shows the following values, each for 10 seconds:

- Disconnection value,

1.

2.

- Calibration value,

1.

2.

- Reaction time.

1.

2.

The change between the first and second display takes places every 2.5 seconds.

Minimum Frequency

After the maximum frequency test, the minimum frequency test takes place and the inverter shows the adjacent display message for 5 seconds.

During the test sequence, the frequency limit applied is shown in the display of the inverter. The frequency limit is increased successively until the shutdown threshold is reached and the inverter disconnects from the grid.

Once the inverter has disconnected from the grid, the display successively shows the following values, each for 10 seconds:

- Disconnection value,

1.

2.

- Calibration value,

1.

2.

- Reaction time.

1.

2.

The change between the first and second display takes places every 2.5 seconds.

6.1.3 Interruption of the Self-Test

If, during the self-test, an unexpected disconnection requirement occurs, the self-test is interrupted. The same applies if the DC voltage is so low that the feed-in can not be continued.

- The inverter then shows the adjacent display message for 10 seconds.

- Restart the self-test as described in the following section 6.1.4 "Restarting the Self-Test" (page 57).

6.1.4 Restarting the Self-Test

In order to restart the self-test, proceed as follows:

1. Disconnect the line circuit breaker and secure against re-connection.
2. Disconnect the multi-function relay power supply, if available.
3. Disconnect the Electronic Solar Switch from the inverter for 5 minutes and then connect it again.

☑ The inverter is now in the initialization phase and you can restart the self-test, as described in section 6.1.1 "Starting the Self-Test by Tapping" (page 52) from point 3.

6.2 Display Messages during Initialization

- Firstly, the firmware version of the internal processors appears in the text lines.

- After 5 seconds or after tapping the enclosure lid, the serial number or the description of the inverter appears. This description can be changed with a communications device.

- After a further 5 seconds, or when you tap again, the configured standard is displayed.

- After a further 5 seconds, or when you tap again, the configured language is displayed.

- In normal operation the scrolling line of the display is subsequently empty. You can refer to the possible event messages in the scrolling lines and their meaning in section 11 "Messages" (page 70).

6.3 Operating Conditions of the Inverter

Startup Procedure

If the inverter has enough voltage and power, the startup process is displayed by means of simultaneous lighting of the three LEDs on the inverter.

As soon as the DC input voltage value defined in the "Vpv-Start" or "Critical voltage to start feed-in" parameter is reached, the inverter starts a number of self-tests and measurement processes and synchronizes with the grid. This operating mode is indicated by the green LED flashing on the inverter.

When the tests are successfully completed and the DC input voltage is above "Vpv-Start" or "Critical voltage to start feed-in", for the time configured in "T-Start" or "Start delay input" the inverter connects to the grid, connects to the characteristic curve mode and the green LED lights up.

Characteristic Curve Operation

The inverter controls the input current depending on the alternator voltage.

The inverter then begins to put a load on the small wind turbine system, takes power from the small wind turbine system according to the present input voltage and then feeds it into the grid. The maximum output corresponds to the maximum AC power of the inverter. However, it can be reduced using the "Pmax" or "Currently set active power limit" parameter.

Shutdown

If the wind strength is so low that the DC input voltage falls below an internally calculated value, then the inverter stops feeding power into the mains grid for the period defined in "T-Stop" or "Deactivation delay". When the DC input voltage increases again, the inverter switches back to characteristic curve operation.

If the DC input voltage remains below an internally calculated value for the time set in "T-Stop" or "Deactivation delay", the inverter will switch off.

If the DC input voltage is so low that it is no longer sufficient to supply the on-board electronics with power, the inverter turns itself off immediately.

7 Disconnecting the Inverter

7.1 Safety

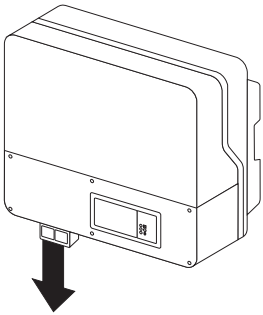
DANGER!
Danger to life due to high voltages in the inverter.

The inverter operates at high voltages.

- Disconnect the inverter as described in the following section.

7.2 Disconnect the device from voltage sources

1. Stop the small wind turbine system and secure against restart.
2. Disconnect the line circuit breaker and secure against re-connection.
3. Disconnect the multi-function relay, if available.
4. Remove the Electronic Solar Switch.



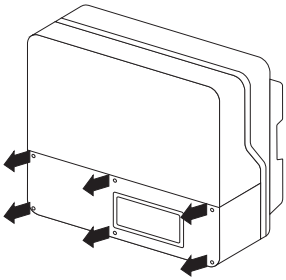
5. Wait until LEDs, display and if applicable the fault indicator have gone off.

DANGER!
Danger to life due to high voltages in the inverter.

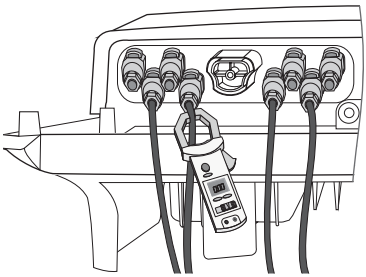
The capacitors in the inverter require 5 minutes to discharge.

- Wait 5 minutes before opening the inverter.

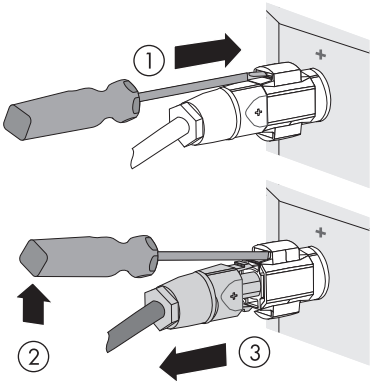
6. Loosen all six captive screws and remove the bottom housing lid.



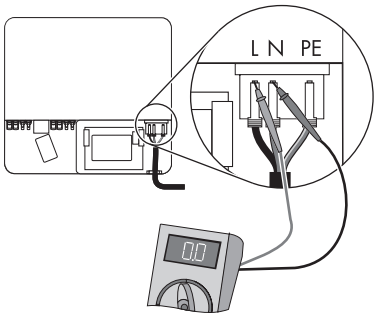
7. Ensure there is no current at any DC cables using a clip-on ammeter.
   ☑ If there is a current present, check the installation.



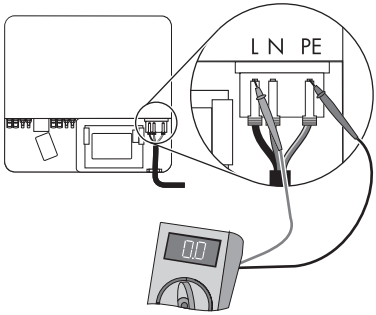
8. Unlock the connected DC plug connectors using a screwdriver:
   - Insert a screwdriver into one of the slits on the sides (1).
   - Lever the screwdriver upward (2) and pull out the plug connector (3).



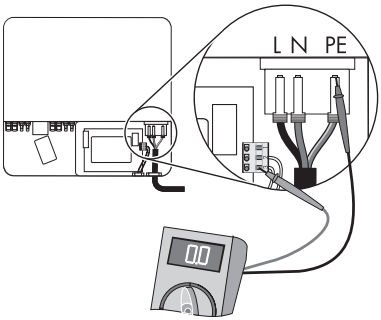
9. Verify the absence of voltage L with respect to N at the AC terminal with an appropriate meter.
   ☑ If there is a voltage present, check the installation.



10. Verify the absence of voltage L with respect to PE at the AC terminal with an appropriate meter.
    ☑ If there is a voltage present, check the installation.

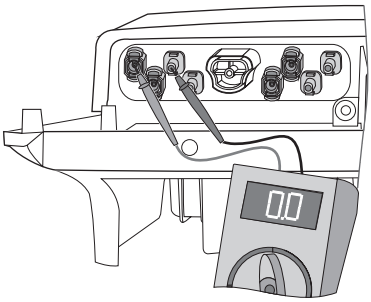


11. Verify the absence of voltage to ground at the multifunction relay.
    ☑ If there is a voltage present, check the installation.



8 Restarting the system

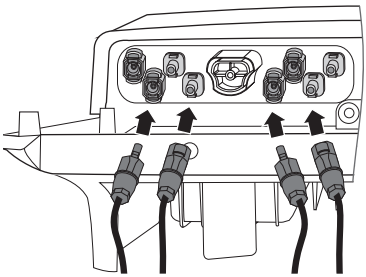
1. Check the DC plug connector for correct polarity.



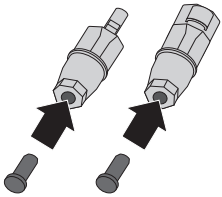
2. Connect one positive and one negative DC plug connector each to both input areas on the inverter.

   To release the DC plug connectors see section 7.2 "Disconnect the device from voltage sources" (page 59).

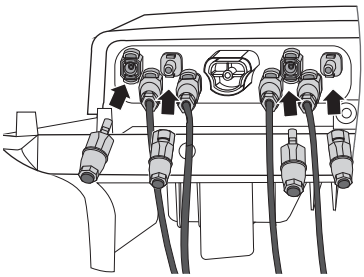
   Never connect all four DC plug connectors to only one input area!



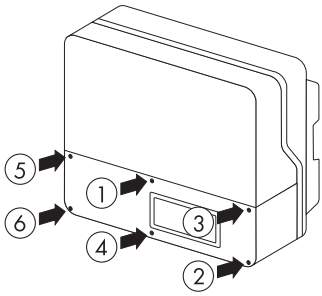
3. To create the seal on the inverter, all DC inputs that are not required must be closed as follows:
   - Insert the sealing plugs provided into the DC plug connectors that are not needed. Do **not** insert the sealing plugs into the DC inputs on the inverter.



   - Insert the DC plug connectors with sealing plugs into the corresponding DC inputs on the inverter.



4. Lock the bottom housing lid with the 6 screws.
   Tighten the screws with 1.4 Nm torque in the order shown in the figure on the right.

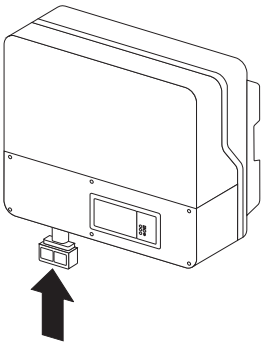


5. Check the Electronic Solar Switch for wear, as described in section 9.2 "Checking the Electronic Solar Switch (ESS) for Wear" (page 68).

CAUTION!

Damage to the Electronic Solar Switch by incorrect connection.

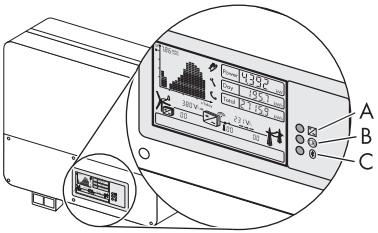
- Firmly connect the Electronic Solar Switch.
- Check firm position of the Electronic Solar Switch.
  The handle of the Electronic Solar Switch must be flush with the housing.



6. If available, switch on the supply voltage of the multi-function relay.
7. Switch on the line circuit breaker.
8. Commission the small wind turbine system in accordance with the instructions of the manufacturer.

9. Check whether the display and LEDs are indicating a normal operating state.

LED	Color	Description
A	Green	Glowing: operation
		Flashing: network connection conditions not yet reached. The inverter only connects to the grid if conditions have been met.
B	Red	Disturbance
C	Blue	*Bluetooth* communication is active



☑ The green LED flashes or lights up in the event of successful recommissioning and the inverter starts initialization (see section 6.2 "Display Messages during Initialization" (page 57)).

The meaning of the illuminated red LED and the meaning of the event numbers on the display are described in section 11.2 "Error Messages" (page 71).

9 Maintenance and Cleaning

9.1 Checking Heat Dissipation

If the inverter regularly reduces its output due to too high warming (temperature symbol on the display illuminates), this can be caused by various factors. Please see the following table for the various causes and measures.

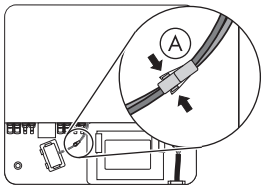
Cause	Action
The cooling fins on the rear side of the enclosure are clogged with dirt.	• Clean the cooling fins with a soft brush.
The ventilation ducts at the top are clogged with dirt.	• Clean the ventilation ducts with a soft brush.
The fan is clogged with dirt.	• Clean fan as described in the following section.

9.1.1 Cleaning the Fan

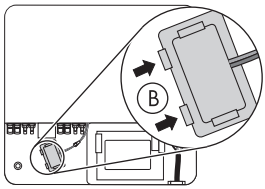
If the fan enclosure is soiled with loose dust, it can be cleaned using a vacuum cleaner. If you do not achieve satisfactory results with a vacuum cleaner, dismantle the fans for cleaning.

Procedure

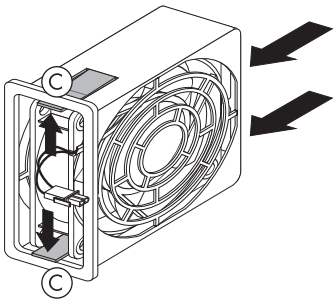
1. Disconnect the inverter as described in section 7 "Disconnecting the Inverter" (page 59).
2. Wait for the fan to stop rotating.
3. Unlock and remove fan plugs (A).



4. Push both fastening clips of the fan (B) towards the fan and remove the housing with the fan.



5. Push the top and bottom fastening clip on the fan (C) to the outside and press out of the housing from the back.



6. Clean the housing with a soft brush, a paint brush, a cloth or compressed air.
7. Clean the fan with a soft brush, a paint brush, or a damp cloth.

CAUTION!

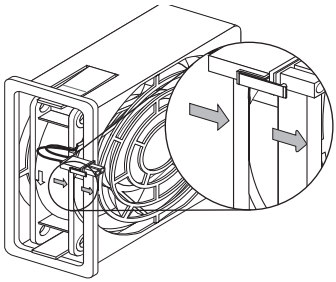
Damage to the fan due to the use of compressed air.

- Do not use compressed air to clean the fan. This can damage the fan.

8. After cleaning, reassemble everything in reverse order.

   The arrows on the fan housing and the fan must point to the right during assembly.

   The fastening clips on the right side of the fan housing must catch underneath the housing wall when inserting them into the inverter.



9. Re-commission the inverter as described in section 8 "Restarting the system" (page 62).

☑ The fan has been cleaned and the inverter is back in operation.

10. Check the functioning of the fans as described in the following section.

9.1.2 Checking the Fans

Checking the Fan

To test the fans you will need a special data logging device (e.g. Sunny WebBox) or a PC with appropriate software (e.g. Sunny Explorer) in order to change the parameters of the inverter.

You will also require the installer password to access installer mode.

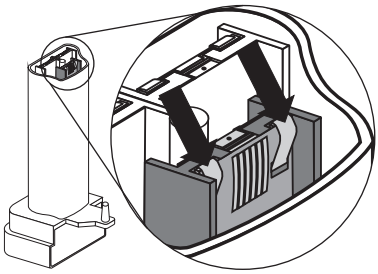
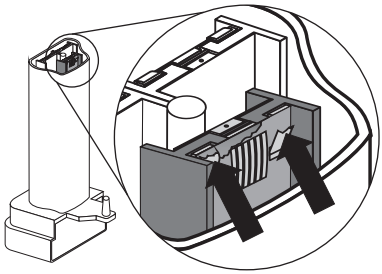
1. Request installer password from the SMA Serviceline (contact see page 92).
2. Set parameters "CoolSys.FanTst" and / or "Fan test" to "On" in installer mode.
3. Check the air-flow of the fan.

   The inverter takes in air at the bottom and it comes out again at the top. Listen for any unusual noise that could indicate incorrect installation or that the fan is faulty.
4. Set parameters "CoolSys.FanTst" and / or "Fan test" to "Off" again.

☑ The fan test has been completed.

9.2 Checking the Electronic Solar Switch (ESS) for Wear

Check the Electronic Solar Switch for wear before plugging it in.

Result	Action
☑ The metal tongues inside the connector are not damaged or discolored. 	• Insert the handle of the Electronic Solar Switch securely in the socket on the underside of the enclosure. • Re-commission the inverter as described in section 8 "Restarting the system" (page 62).
☑ The metal tongues inside the connector have a brown discoloration or are burned through. 	The Electronic Solar Switch can no longer safely disconnect the DC side. • Replace the Electronic Solar Switch handle before attaching it again (for the order number see section 15 "Accessories" (page 91). • Re-commission the inverter as described in section 8 "Restarting the system" (page 62).

10 Slot for SD card

The inverter is equipped with an SD card slot. The slot is on the left below the display.

There are a number of cases which require an SD card to be read in, such as:

- Under consultation with the SMA Serviceline, a firmware update is necessary.

  SMA Solar Technology AG will send you a file with the firmware update per e-mail.

  You will find the description of the Firmware update in the download area at www.SMA.de/en.
- You require adjusted parameter settings for you installation location.

  Request these from SMA Solar Technology AG. SMA Solar Technology AG will then send you a file with the relevant settings and instructions on how to install these per e-mail.
- Enter the Grid Guard Code to set a new country standard with the rotary switch or to be able to change parameters. If required, request a manual on the procedure from SMA Solar Technology AG or it is shipped with the necessary data.

Properties of the SD Card

Use an SD card with a maximum capacity of 2 GB.

Use the SD card exclusively for this inverter. Do not save any multimedia files or other unsuitable files on the SD card.

11 Messages

11.1 Event messages

During an update, the relevant display message is shown in the text line of the display.

Display	Description
< Inst. code valid >	The Grid Guard Code entered is valid. The configured country data set is now unblocked and can be changed. If the configured country data set is protected, the unlocking is valid for a maximum of 10 feed-in hours.
< No new update SDcard >	There is no update relevant for this inverter on the SD card or the present update has already been installed.
< Grid param.unchanged >	The selected switch setting is not programmed or there is no country data set available on the SD card.
< Parameters set successfully >	A new country data set has been configured.
< SD card is read >	The inverter is currently reading the SD card.
< Set parameter >	The inverter sets the adjusted parameters.
< Update completed >	The inverter has successfully completed the update.
< Update Bluetooth >	Successful update of the *Bluetooth* components.
< Update display >	Successful display update.
< Update main CPU >	Successful update of inverter component.
< Update communication >	Successful update of communication component.
< Update RS485I module >	Successful update of communication interface.
< Upd. language table >	Successful update of language table.
< Update file OK >	The file found is valid.

11.2 Error Messages

When errors occur, a display message including the corresponding event number will appear in the text line of the display. By tapping on the enclosure lid, multi-line messages can be switched further.

If the error persists for a prolonged period, the red LED lights on and the fault signaling contact is activated.

Event no.	Cause	Corrective measures
1	< Grid fault > The grid voltage has exceeded the permissible range. This error can have the following causes: • The grid voltage at the point of connection of the inverter is too high. • Grid impedance at the terminal of the inverter is too high. For safety reasons, the inverter disconnects itself from the grid.	• Check the grid voltage and grid connection on the inverter. If the grid voltage lies outside the acceptable range because of local grid conditions, ask the utility operator if the voltage can be adjusted at the feed-in point or if he agrees to changes in the values of the monitored operational limits. If the grid voltage lies within the tolerance range, yet this error is still being displayed, contact the SMA Serviceline.
2	< Grid fault > The grid voltage has fallen below the permissible range. This error can have the following causes: • Grid disconnected • AC cable damaged • The grid voltage at the point of connection of the inverter is too low. For safety reasons, the inverter disconnects itself from the grid.	• Check the triggering of the line circuit breaker. • Check the grid current and the grid connection on the inverter. If the grid voltage lies outside the acceptable range because of local grid conditions, ask the utility operator if the voltage can be adjusted at the feed-in point or if he agrees to changes in the values of the monitored operational limits. If the grid voltage lies within the tolerance range, yet this error is still being displayed, contact the SMA Serviceline.

Event no.	Cause	Corrective measures
3	< Grid fault > The average grid voltage over 10 minutes is no longer within the permissible range. This can have the following causes: • The grid voltage at the point of connection of the inverter is too high. • Grid impedance at the terminal of the inverter is too high. The inverter disconnects to assure compliance with the voltage quality of the grid.	• Check the grid voltage at the point of connection of the inverter: If due to local grid conditions the grid voltage exceeds the configured limiting value, ask the utility operator whether the voltage can be adjusted at the feed-in point, or whether he will agree to a modification of the limiting value for voltage quality monitoring. If the grid voltage is continually within the acceptable range, and this error is still displayed, contact the SMA Serviceline.
4	< Grid fault > The inverter has left the grid parallel operation and for safety reasons interrupted feeding-in.	• Check the power supply line for strong, short-term frequency variations.
5	< Grid fault > The grid frequency is not within the permissible range. For safety reasons, the inverter disconnects itself from the grid.	• If possible, check the grid frequency and observe how often major deviations occur. If repeated frequency variations occur and as a result this error occurs, ask the grid operator if it would agree to modify the operating parameter. Discuss the proposed parameters with the SMA Serviceline.
6	< Grid fault > The internal inverter monitoring has detected an impermissibly high proportion of direct current in the grid current.	• Check the power supply line for direct current. • If this is a recurrent phenomenon, check with the grid operator whether it is possible to raise the limiting value of monitoring.
7	< Frq. not permitted > The grid frequency has left the allowable range. For safety reasons, the inverter disconnects itself from the grid.	• As far as possible, check the grid frequency and observe how often major fluctuations occur. If repeated frequency variations occur and as a result this error occurs, ask the grid operator if it would agree to modify the operating parameter. Discuss the proposed parameters with the SMA Serviceline.

Event no.	Cause	Corrective measures
8	< Grid failure > < Waiting for grid voltage >	• Check fuse. • Check AC installation. • Check whether there is a general black-out.
9	< PE conn. missing >	• Check AC installation. • Connect the PE cable to the AC terminal as described in section 5.3.2 "Connecting the Inverter to the Power Distribution Grid (AC)" (page 29).
10	< L / N swapped >	• Adjust the connection as described in section 5.3.2 "Connecting the Inverter to the Power Distribution Grid (AC)" (page 29).
11	< Installation fault > < 2nd phase conn. to N >	• Adjust the connection as described in section 5.3.2 "Connecting the Inverter to the Power Distribution Grid (AC)" (page 29).
33	< Unstable operation > The supply at the DC input of the inverter is not sufficient for stable operation.	• Wait for higher and more constant wind speeds. • If the event reoccurs in the event of medium-high and more constant wind speeds, check the layout of the small wind turbine system.
34	< DC overvoltage > The DC input voltage connected to the inverter is too high.	• **Disconnect inverter from Windy Boy Protection Box immediately as described in section 7.2 "Disconnect the device from voltage sources" (page 59)! Otherwise, the inverter may be destroyed.** • Before reconnecting the inverter to the Windy Boy Protection Box, check that the maximum input voltage of the inverter and check the DC voltage of the Windy Boy Protection Box when operating the small wind turbine system.

Event no.	Cause	Corrective measures
35	< Insulation resist. > The inverter has detected a ground fault in the system.	• Check small wind turbine system for ground fault as described in section 12.1 "Checking the Small Wind Turbine System for a Ground Fault" (page 77). • Have the ground fault rectified by the installer of the small wind turbine system before reconnecting the affected cable.
36	< High discharge curr. > The leakage current of the inverter and the small wind turbine system is too high. This can be caused by a sudden grounding fault, failure current or an actual fault in the device. The inverter interrupts grid feed immediately after exceeding a limiting value and then automatically re-connects to the grid.	• Check small wind turbine system for ground fault as described in section 12.1 "Checking the Small Wind Turbine System for a Ground Fault" (page 77). • Have the ground fault rectified by the installer of the small wind turbine system before reconnecting the affected cable.
37	< Resid.curr.too.high >	• Check small wind turbine system for ground connection as described in section 12.1 "Checking the Small Wind Turbine System for a Ground Fault" (page 77). • Have the ground fault rectified by the installer of the small wind turbine system before reconnecting the affected cable.
38	< DC overcurrent > An overcurrent condition occurs on the DC side of the inverter and it switches off.	If this event occurs often: • Check layout and connections of the small wind turbine system.
39	< Waiting for DC start conditions > The input cable or input voltage of the small wind turbine system is still insufficient for feeding into the grid.	• Wait for higher wind speeds. • If the event reoccurs in the event of medium-high wind speeds, check the layout of the small wind turbine system.
60 - 64	< Interference device >	• Contact the SMA Serviceline (see section 16 "Contact" (page 92)).

Event no.	Cause	Corrective measures
65	< Overtemperature > Inverter switches off due to excess temperature.	• Ensure sufficient ventilation. • Check heat dissipation, as described in section 9.1 "Checking Heat Dissipation" (page 65).
66	< Overload >	• Contact the SMA Serviceline (see section 16 "Contact" (page 92)).
67	< Comm. disturbed > A fault has occurred in the internal communication of the inverter. However, the inverter continues feeding into the grid.	If this event occurs often: • Contact the SMA Serviceline (see section 16 "Contact" (page 92)).
68 - 70	< Interference device >	• Contact the SMA Serviceline (see section 16 "Contact" (page 92)).
71	< SD card defective >	Re-format the SD card. • Re-save the files to the SD card.
	< Parameter file not found or defective >	• Copy the parameter file into the card drive:\PARASET directory.
	< Param. setting failed >	• Check the parameters for valid values. • Ensure authentication for modification with Grid Guard Code.
	< Update file defect. >	• Re-format the SD card. • Re-save the files to the SD card.
	< No update file found >	• Copy the update file into the SD card drive:\UPDATE directory.
72	< Data stor. not poss. > Internal device fault: however, the inverter continues to feed in.	• If this fault occurs often, contact the SMA Serviceline (see section 16 "Contact" (page 92)).

Event no.	Cause	Corrective measures
73	< Update main CPU failed > Internal device fault.	• Contact the SMA Serviceline (see section 16 "Contact" (page 92)).
	< Update RS485I module failed > Internal device fault: however, the inverter continues to feed in.	• Retry update. • If this fault occurs again, contact the SMA Serviceline (see section 16 "Contact" (page 92)).
	< Update BT failed > Internal device fault: however, the inverter continues to feed in.	
	< Upd. display failed > Internal device fault: however, the inverter continues to feed in.	
	< Update language table failed > Internal device fault: however, the inverter continues to feed in.	
74	< Varistor defective >	• Check the varistors as described in section 12.2 "Checking the Functioning of the Varistors" (page 80).
80	< Derating occurred > The delivered power of the inverter was reduced below nominal power due to a too-high temperature for more than 10 minutes.	If this event occurs often: • Ensure sufficient ventilation. • Check heat dissipation, as described in section 9.1 "Checking Heat Dissipation" (page 65).
90	< Inst. Code invalid > The entered installer code (personal) is invalid.	• Enter valid Grid Guard Code.
	< Grid param. locked > The actual country data set is locked.	• Enter valid Grid Guard Code to change the country data set.
	< Waiting for main CPU > • DC voltage at the DC input is not sufficient to run the main computer. • The selected rotary switch setting for the country configuration is not programmed. • The parameters to be changed are protected.	• Ensure sufficient DC voltage (green LED lights up or flashes). • Check the setting of the rotary switches (see section 5.4.2). • Enter Grid Guard Code.

12 Troubleshooting

12.1 Checking the Small Wind Turbine System for a Ground Fault

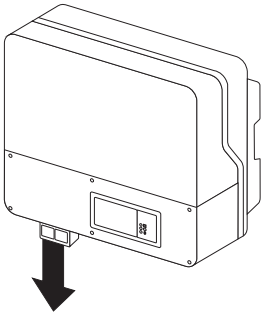
If the inverter displays event numbers "35", "36" or "37", there is a high probability of a ground fault in the system.

Check the small wind turbine system for ground connection as described below:

DANGER!
Danger to life due to high voltages in the inverter.

- Stop the small wind turbine system and secure against restart.
- Disconnect the line circuit breaker and secure against re-connection.
- Disconnect the multi-function relay, if available.

1. Remove the Electronic Solar Switch.



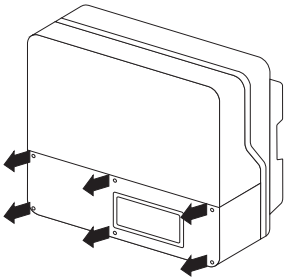
2. Wait until LEDs, display and if applicable the fault indicator have gone off.

DANGER!
Danger to life due to high voltages in the inverter.

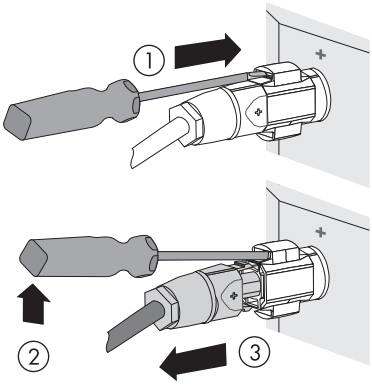
The capacitors in the inverter require 5 minutes to discharge.

- Wait 5 minutes before opening the inverter.

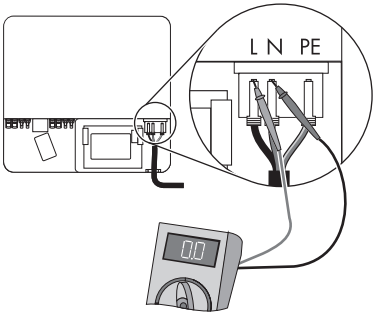
3. Loosen all six captive screws and remove the bottom housing lid.



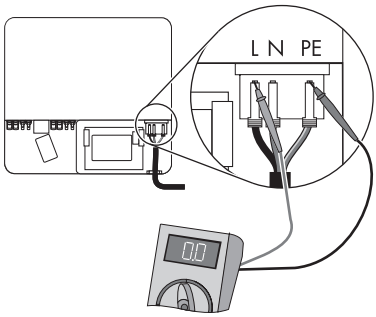
4. Unlock the connected DC plug connectors using a screwdriver:
   - insert a screwdriver into one of the slits on the sides (1).
   - Lever the screwdriver upward (2) and pull out the plug connector (3).



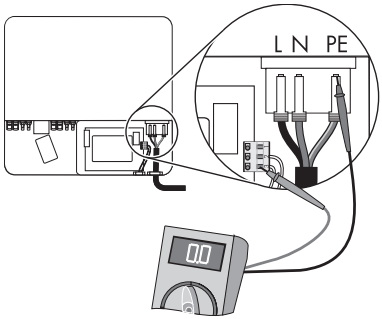
5. Verify the absence of voltage L with respect to N at the AC terminal with an appropriate meter.
   ☑ If there is a voltage present, check the installation.



6. Verify the absence of voltage L with respect to PE at the AC terminal with an appropriate meter.
   ☑ If there is a voltage present, check the installation.



7. Verify the absence of voltage to ground at the multifunction relay.
   ☑ If there is a voltage present, check the installation.



8. Disconnect L1, L2 and L3 of the small wind turbine system from the Windy Boy Protection Box.
9. Measure the resistance between L1 of the small wind turbine system and the ground potential.
10. Measure the resistance between L2 of the small wind turbine system and the ground potential.
11. Measure the resistance between L3 of the small wind turbine system and the ground potential.

Result	Action
The measured resistance is virtually infinite. ☑ There is no ground fault at the small wind turbine system.	The his probably a ground fault in the Windy Boy Protection Box or in the supply cables to the inverter. • Disconnect the Windy Boy Protection Box from the inverter and measure resistance of all connectors and the ground potential.
The measured resistance is very small (< 10 Ω). ☑ There is no ground fault at the small wind turbine system.	• Have the ground fault rectified by the installer of the small wind turbine system before reconnecting the small wind turbine system to the Windy Boy Protection Box.

12.2 Checking the Functioning of the Varistors

If the inverter displays event number "74", one of the varistors has probably lost its protective function due to repeated stress.

Check the varistors as described below:

1. Disconnect the inverter as described in section 7.2 "Disconnect the device from voltage sources" (page 59).

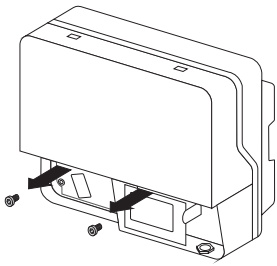
DANGER!

Danger to life due to high voltages in the inverter.

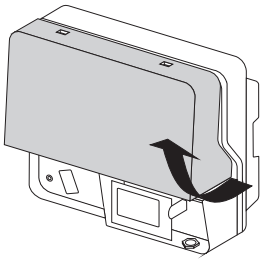
The capacitors in the inverter require 5 minutes to discharge.

- Wait 5 minutes before opening the housing cover, in order to allow time for the capacitors to discharge!

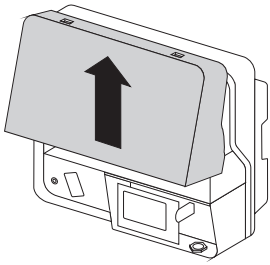
2. Undo the screws of the top housing lid.



3. Pull the housing lid to the front at the bottom edge.



4. Push the housing lid to the top and remove it.



CAUTION!

Electrostatic discharges can damage the inverter.

Components on the inside of the inverter may be irreparably damaged due to electrostatic discharge.

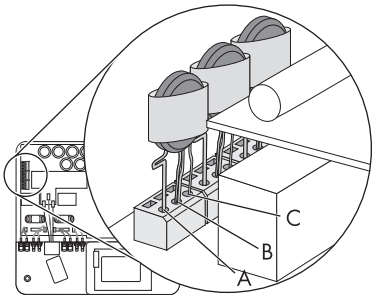
- Ground yourself before touching a component.

Position of Varistors

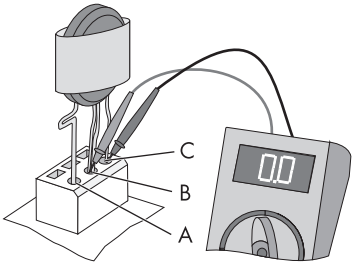
See the following illustration to determine the position of the varistors.

Observe the following allocation of the terminals:

- Terminal A: outer terminal
  (Varistor connection with loop [crimp])
- Terminal B: middle terminal
- Terminal C: outer terminal
  (Varistor connection without loop [crimp])



5. Use a Multimeter to ensure that all of the varistors in the installed state have a conducting connection between connectors B and C.



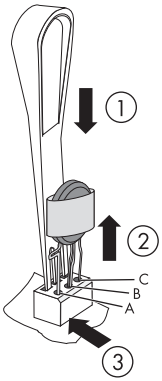
Event	Action
☑ There is a **conductive** connection.	There is probably a different fault in the inverter. • Continue with point 9. • Contact the SMA Serviceline (see section 15 "Accessories" (page 91)).

Event	Action
☑ There is **no conductive** connection.	The respective varistor is defective and must be replaced. Varistor failure is generally due to influences which affect all varistors similarly (temperature, age, induced overvoltage). SMA Solar Technology AG recommends that you replace both varistors. The varistors are specially manufactured for use in the inverter and are not commercially available. Spare varistors must be ordered directly from SMA Solar Technology AG (see section 15 "Accessories" (page 91)). • To replace the part, proceed to step 6.

6. Insert an insertion tool into the openings of the terminal contacts (1).

   ☑ This releases the terminals.

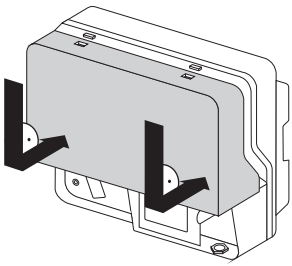
   If you do not receive an insertion tool for operating the terminal clamps with your replacement varistors, contact SMA Solar Technology AG. As an alternative, the terminal contacts can be operated using a 3.5 mm wide screwdriver.



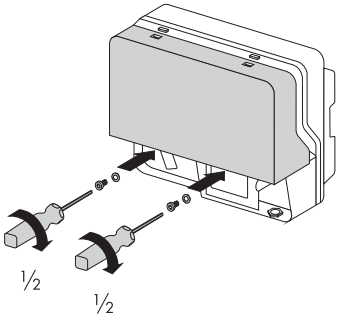
7. Remove the varistor (2).
8. Insert new varistor (3).

   The pole with the small loop (crimp) must be fitted to terminal A when remounting (3).

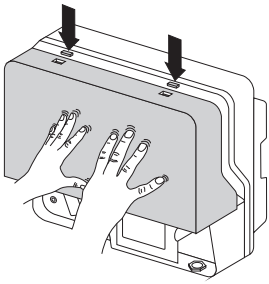
9. Align the housing lid vertically.



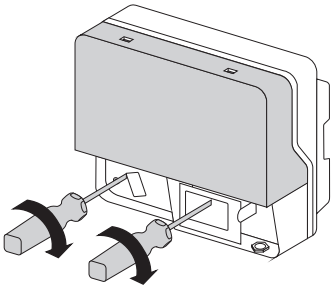
10. Fasten the screws and the washers half way.



11. Press the housing lid onto the housing until it catches at the top.



12. Fasten both screws of the housing lid to a tightening torque of 2.4 Nm.



13. Close the bottom housing lid and recommission the inverter as described in section 8 "Restarting the system" (page 62).

☑ The check and replacement of the varistors is completed.

13 Decommissioning

13.1 Dismantling the Inverter

1. Disconnect the inverter and open the bottom housing lid as described in section 7.2 "Disconnect the device from voltage sources" (page 59).
2. Remove all cables from the inverter.

CAUTION!

Danger of burn injuries due to hot enclosure parts.

- Wait 30 minutes for the housing to cool down.

3. If mounted with top hat rail: undo screw between wall and housing.
4. Disconnect the anti-theft protection, if applicable.
5. Push the inverter to the left and remove from the wall-mount or the top hat rail.

13.2 Packing the Inverter

If possible, always pack the inverter in its original packaging. If it is no longer available, you can also use an equivalent carton. The box must be capable of being closed completely and made to support both the weight and the size of the inverter.

13.3 Storing the Inverter

Store the inverter in a dry place where ambient temperatures are always between − 25 °C and +60 °C.

13.4 Disposing of the Inverter

Dispose of the inverter at the end of its service life in accordance with the disposal regulations for electronic waste which apply at the installation location at that time. Alternatively, send it back to SMA Solar Technology AG with shipping paid by sender, and labeled "ZUR ENTSORGUNG" ("FOR DISPOSAL") (contact see section 16 "Contact" (page 92)).

14 Technical Data

14.1 Windy Boy 3600TL

DC Input

Maximum DC voltage	550 V
MPP input voltage range	80 V ... 440 V
Maximum open circuit voltage to activate "Turbine Mode"	125 V
DC nominal voltage	400 V
Maximum input current	2 x 15 A
Maximum DC power	3,800 W
Voltage ripple	< 10 % of the input voltage

AC Output

Nominal AC power	3,600 W
Maximum AC power	3,600 W
Nominal AC current	15.7 A
Maximum output current	22 A
Maximum fuse protection	32 A
Harmonic distortion of output current at AC THD voltage < 2 %, AC power > 0.5 AC nominal power	< 3 %
Nominal AC voltage	220 V / 230 V / 240 V
AC voltage range, extended operating range*	180 V ... 280 V
AC grid frequency*	50 Hz / 60 Hz
Tolerance at AC grid frequency	± 5 Hz
Power factor at nominal AC power	1
Overvoltage category	III
Test voltage at 50 Hz (1 s routine testing / 5 s type testing)	1.4 kV
Surge testing voltage	4 kV
Serial interface	6 kV
Internal consumption in standby	< 0.5 W

* Depends on country configuration

Mechanical Data

Width x height x depth	470 mm x 445 mm x 180 mm
Weight	25 kg

Climatic Conditions

Extended temperature range *	− 25 °C ... +60 °C
Extended humidity range *	0 % ... 100 %
Extended air pressure range *	79.5 kPa ... 106 kPa
Temperature range **	− 25 °C ... +70 °C
Operating temperature range	− 25 °C ... +60 °C
Maximum operating altitude above mean sea level	2,000 m

* according to DIN EN ISO 50178:1998-04, installation type C, class 4K4H

** according to DIN EN ISO 50178:1998-04, transport type E, class 2K3

Features

Topology	Transformerless
Cooling concept	OptiCool

General data

Electronics protective rating*	IP65
Connection area protection rating*	IP54
Protection class	I
Noise emission (typical)	≤ 25 dB(A)

* according to IEC 60529

Protective Devices

All-pole DC disconnection unit	Electronic Solar Switch, DC plug system SUNCLIX
DC overvoltage protection	Thermally monitored varistors
Personal protection (R_{iso} > 1 M Ω)	Insulation monitoring
Reverse-polarity protection	Short-circuit diode
AC short circuit protection	Current control
All-pole AC disconnection unit	Automatic disconnection device SMA Grid Guard 3

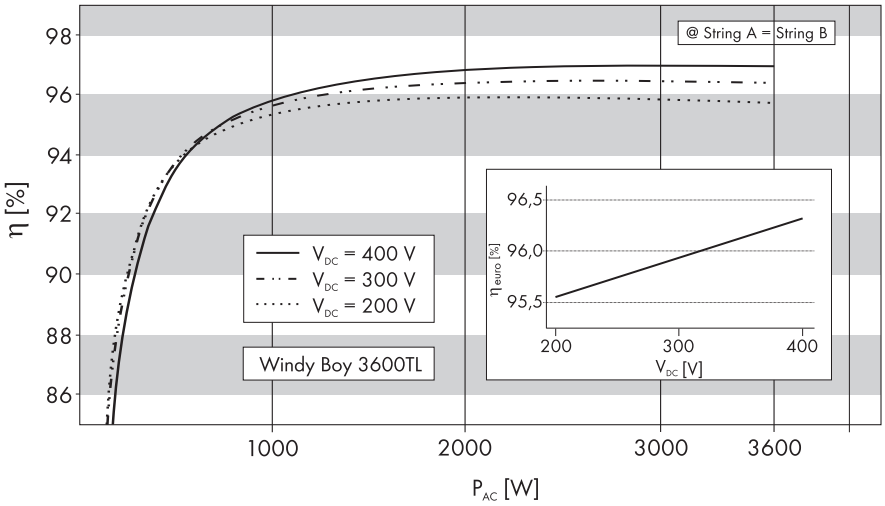
Communication Interfaces

RS485, galvanically isolated	optional
Bluetooth® Wireless Technology	Standard

Electronic Solar Switch (ESS)

Electrical service life in the event of a short circuit, with a nominal current of 35 A	A minimum of 50 switching operations
Maximum switching current	35 A
Maximum switching voltage	800 V
Maximum PV power	12 kW
Protection rating when plugged	IP65
Protection rating when unplugged	IP21

Efficiency



Peak efficiency	97.0 %
European efficiency	96.3 %

14.2 Windy Boy 5000TL

DC Input

Maximum DC voltage*	550 V
MPP input voltage range	80 V ... 440 V
Minimum open circuit voltage to activate "Turbine Mode"	125 V
DC nominal voltage	400 V
Maximum input current	2 x 15 A
Maximum DC power	5,300 W
Voltage ripple	< 10 % of the input voltage

* The maximum open circuit voltage, which can occur at a cell temperature of –10 °C, may not exceed the maximum input voltage.

AC Output

AC nominal output*	4,600 W / 5,000 W
Maximum AC power	5,000 W
Nominal AC current	20 A
Maximum output current	22 A
Maximum fuse protection	32 A
Harmonic distortion of output current at AC T_{HD} voltage < 2 %, AC power > 0.5 AC nominal power	< 3 %
Nominal AC voltage	220 V / 230 V / 240 V
AC voltage range, extended operating range*	180 V ... 280 V
AC grid frequency*	50 Hz / 60 Hz
Tolerance at AC grid frequency	± 5 Hz
Power factor at nominal AC power	1
Overvoltage category	III
Test voltage at 50 Hz (1 s routine testing / 5 s type testing)	1.4 kV
Surge testing voltage	4 kV
Serial interface	6 kV
Internal consumption in standby	< 0.5 W

* Depends on country configuration

Mechanical Data

Width x height x depth	470 mm x 445 mm x 180 mm
Weight	25 kg

Climatic Conditions

Extended temperature range*	– 25 °C ... +60 °C
Extended humidity range *	0 % ... 100 %
Extended air pressure range *	79.5 kPa ... 106 kPa
Temperature range **	– 25 °C ... +70 °C
Operating temperature range	– 25 °C ... +60 °C
Maximum operating altitude above mean sea level	2,000 m

* according to DIN EN ISO 50178:1998-04, installation type C, class 4K4H

** according to DIN EN ISO 50178:1998-04, transport type E, class 2K3

Features

Topology	Transformerless
Cooling concept	OptiCool

General data

Electronics protection rating	IP65
Protection rating of connection area	IP54
Protection class	I
Noise emission (typical)	≤ 29 dB(A)

* according to IEC 60529

Protective Devices

All-pole DC disconnection unit	Electronic Solar Switch, DC plug system SUNCLIX
DC overvoltage protection	Thermally monitored varistors
Personal protection (R_{iso} > 1 M Ω)	Insulation monitoring
Reverse-polarity protection	Short-circuit diode
AC short circuit protection	Current control
All-pole AC disconnection unit	Automatic disconnection device SMA Grid Guard 3

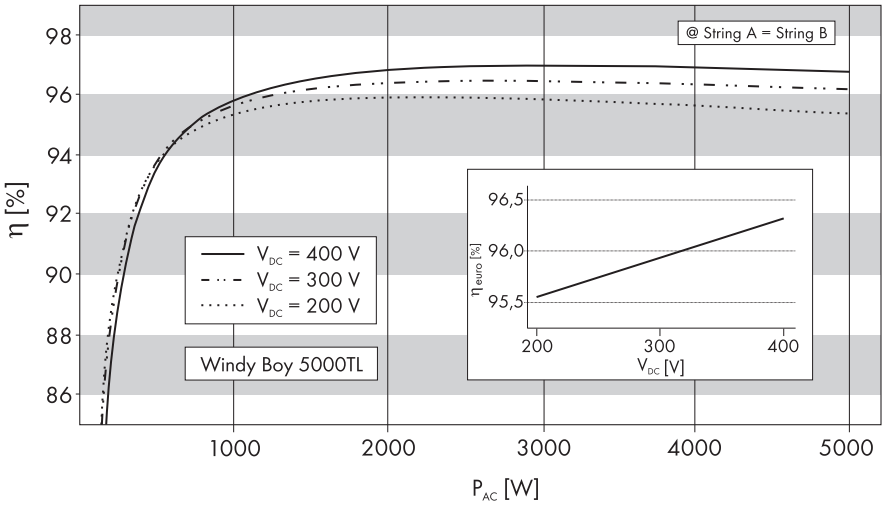
Communication Interfaces

RS485, galvanically isolated	optional
Bluetooth® Wireless Technology	Standard

Electronic Solar Switch (ESS)

Electrical service life in the event of a short circuit, with a nominal current of 35 A	A minimum of 50 switching operations
Maximum switching current	35 A
Maximum switching voltage	800 V
Maximum PV power	12 kW
Protection rating when plugged	IP65
Protection rating when unplugged	IP21

Efficiency



Peak efficiency	97.0 %
European efficiency	96.5 %

15 Accessories

You will find the corresponding accessories and replacement parts for your inverter in the following overview. If required, you can order these from SMA Solar Technology AG or your dealer.

Description	Brief description	SMA order number
Replacement varistors	Set of thermally monitored varistors	MSWR-TV8 (3 units)
ESS holder	Electronic Solar Switch holder as spare part	ESS-HANDLE:05
RS485 upgrade kit	RS485 interface	DM-485CB-10
SUNCLIX DC plug connector	Field plug for conductor cross sections of 2.5 mm² ... 6 mm²	SUNCLIX-FC6-SET

16 Contact

If you have technical problems concerning our products, contact the SMA Serviceline. We require the following information in order to provide you with the necessary assistance:

- Inverter type
- Inverter serial number
- Type of connected small wind turbine system
- Optional equipment, e.g. communication devices
- Type of multi-function relay connected, if applicable

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www.SMA.de

SMA Serviceline

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E-mail:	Serviceline@SMA.de

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